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GEOGRAPHY.

EXPLORATIONS IN IDAHO AND MONTANA.

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In 1878 I made an extended exploration of the Territories of Idaho and Montana. This included not only the instrumental part of a thorough railway survey, but also a critical examination of the natural and artificial productions of that region embraced between British America, on the north, and Ogden, Utah, on the south, and from the head of the Yellowstone River on the east to the valley of Hell Gate and Wisdom River on the west, a region we found replete with the most interesting natural scenery and the most striking objects that it has ever been our fortune to witness.

Without undue egotism, I really believe that our varied, rare and beautiful scenery, for a full exhibition of all the abnormal phenomena of fire, air and water, this portion of our republic, exceeds any similar extent in any other region under the sun. Montana Territory is a land full of wonders, and, with Idaho Territory, they seem to form an area of surface where the former energies, so potently exerted in past geological ages, have not yet found a rest. The cosmographers and philosophers of the Middle Ages were wont to ascribe many phenomena, many geognostic facts, to the "plastic effects of Nature," as if the earth had in itself some free-agency power to control its phenomena. Were this so, they could

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have found some color for this fancy in the variety of natural objects of nature's energies so liberally found in these two Territories.

Idaho Territory is a veritable "Phlegræan Field." My unknown friends of the Academy can imagine a vast flat plain, covered from the foot of the mountain ranges of Eastern Idaho for several hundred miles west with an uniform close covering of sage brush—the *Artemisia tridentata* of botanists, or, as the Canadian voyagers three quarters of a century since called it, "*absinthe.*" This gives an uniform dull gray tint of inconceivable melancholy to what in other respects would often be charming and picturesque. From this plain, formed wholly of lava, covered with a thin coat of sand, and still scantier stratum of vegetable soil, which, however, is generally absent, and nothing grows upon this sterile surface but cactus and artemisia.

The lava plain of Idaho is seamed in a few places by some unimportant streams, the major part of them emptying into Snake River, or its main affluent, Henry's Fork. Aside from this, universal drouth prevails, and 90 100ths of Idaho is doomed to eternal sterility. Universally, all the rivers and smaller creeks flow in deep crevices in black honey-combed lava, abounding in rapids and deep pools of cool, clear water, and in magnificent trout. Snake River, the main southern branch of the majestic Columbia, has cut out its bed in this dark lava. It is a fine deep river, swift, impetuous and dangerous. The American Falls, some seventy miles below Fort Hall, are stupendous and magnificent. Here the whole water of this magnificent stream is precipitated down a step in the lava field over 140 feet high.

In the course of our exploration, when surveying our return line by the valley of Madison Fork and Fire Hole River, we left the last named stream on our left, and to avoid its steep and tangled cañons, we prolonged our line of survey over the main Rocky Mountain range by Raynolds' Pass to Henry's Lake, the source of Henry's Fork of Snake River. From this lake we turned sharply eastward, crossed the Rocky Mountains by the Tahgee Pass, 7470 feet above the sea, and reached Fire Hole Valley and the marvelous geysers of the National Park by an easy natural wagon road.

Fire Hole River, from the west edge of the National Park to the several geyser basins, flows through a valley cut through lofty, picturesque, but ragged trachyte mountains, covered with scrub pines, with glades interspersed, clothed with scanty grass. The first cañon in the National Park is grand and weird, seamed with traces of recent volcanic action. Its wildness was rendered more salient from our continued watch night and day to prevent surprise from small bands of hostile Indians driven eastward by Gen. Howard's campaign against the Piutes and Bannocks. With some labor, and by vigorous exertion, we carried our line of reconnoissance up to the Upper Geyser Basin, our wagons being the second only that had penetrated to that point.

I confess that my ideas are barren and my mind bewildered by the amount of objects that three days exploration of that extraordinary region developed. We were then in the first days of October. Before reaching the geyser region,

hard frosts at night, and a temperature one morning to zero Fahrenheit, rendered our couches on the volcanic soil cold and restless. Once, however, in the midst of this region of subterranean fires and lakes of scalding water, we felt no more the cold chill of the lower valleys. A soft moist air in the day, foggy mists, or columns of steam, rendered more visible from the greater coolness of the atmosphere, made our mornings enjoyable by their novelty. In the pines, in the open prairies along Fire Hole River, we could see the steam rising from myriads of scalding springs or clear basins of scalding water. Occasionally a magnificent column of steam and boiling water would rush aloft swiftly and play from one to ten minutes in duration. Old Faithful, the Giant, the Giantess, the Castle Geyser, the Beehive, the Fountain, and a countless host of smaller spurting fountains made it difficult to follow any determined course. Everywhere—above, below, around—the hidden energies of subterranean forces were manifest. When near some of the more active vents—some of the more demonstrative *safety-valves* they might be called—we could hear the smothered, labored pent-up groans, or what one would imagine were the desperate struggles of some cavern full of struggling life striving to escape. We stood, as it were, in the mythological Hades; we wandered in imagination on the banks of Cocytus.

"Cocytus, named of lamentations loud
Heard on the rueful stream."

The whole ground surface in the geyser basin seems to be made up wholly from the varied mineral deposits of the countless myriads of hot springs. We notice in every direction a peculiar resonance when we ride or drive over the ordinary surface. We seem to wander over a dome erected over immense subterranean lakes of pent-up steam and boiling water. At the surface, the general boiling point varied from 199° to 200°. Dr. Peale, however, (who was then in the Park,) informed me that a self-registering thermometer shoved some fifteen or sixteen feet down the geyser orifices gave him a temperature of 209°, evidently due to an abnormal compression having in these subterranean reservoirs raised the boiling point.

The National Park is well worthy of that title, and for future time its capabilities and its surprising natural phenomena will always render it of most extraordinary interest. I can say but little of the fauna and flora of the National Park. Elk, moose, deer, antelope, mountain sheep, bears, wolves, wild cats, lynx, rabbits and porcupines, with some beautiful foxes, were all we obtained. Birds were scarce, and of only fifteen species, including an abundance of ducks, geese, swans and sage-hens. We were too late for summer flowers, and generally the whole of the sylva of the park consist of pine, red fir, spruce, one species of cottonwood, and ever-present quaking aspen; scrubby willows and some insignificant bushes of Rhus and Cornus complete nearly the whole list.

Completing our surveys in the Park, we turned to the west again, reached Henry's Lake, and tried to follow the west side of Henry's Fork to Snake River. Baffled in this, we traveled westward to Camass Creek, reached the regular stage

road at Beaverhead Cañon, and finally reached Fort Hall and Portneuf River October 19–20, 1878.

During this whole journey I made continued examinations for archæological relics, but had very little success until we reached Upper Madison Fork. Here and around Henry's Lake, Henry's Fork and Beaverhead Cañon, and on Market Lake and Snake River, I gathered some very characteristic obsidian implements which I transmit to the Academy for illustration.

I have always understood, until within a few years, that the presence of obsidian weapons in Kansas, Colorado, Nebraska and Wyoming, and in Utah also, was due to the probable intercourse of exchange from the Indians, or we may say Astec races, of Mexico, with the more northern tribes. I am satisfied that whatever obsidian arrows, lance-heads and leaf-shaped implements I have found in Colorado, Wyoming, Nebraska, etc., were more probably derived from the Yellowstone and from Snake River rather than from New and Old Mexico. Obsidian implements begin to abound from Great Salt Lake northward; and on Portneuf and Snake and Henry's Fork of Snake River, in the National Park, and on Madison Fork its abundance everywhere, both wrought and unwrought, ceased to become extraordinary or noticeable. I have been assured by reliable, trusty residents of Idaho and Utah Territories that even to this date, not farther back than fifteen to twenty years ago, they have repeatedly seen the Bannock and Snake Indians of that region make themselves arrow-heads of obsidian, beautifully and skillfully worked out of flakes, by a simple process of slow clipping on the edges by means of a buckhorn tool, with a cross notch, holding the flake in a piece of buckskin so as not to cut their hands on the fresh, sharp edges of the obsidian flake.

In the National Park Prof. Hayden's parties found a gorge in the mountains which is almost entirely formed of volcanic glass; they have aptly named it Obsidian Cañon. Here, evidently, the material has been used from time immemorial for flaking and conversion into implements. The most common form I have found was leaf form, some of them as much as five or six inches long and well proportioned. Some arrow-heads of obsidian, unfortunately lost in the mountains, are beautifully and regularly worked, and one especially was as if made only a few days before, as it retained an edge and a point as keen as a razor.

The antiquities I have noticed and examined on Madison Fork, extend along the river for three or four miles. These consist of large rings of stones, generally rounded and water-worn. Some of them surround low mounds now scarcely one and one half feet high, as if an old wall around the mound. These were mostly noticed about twenty miles southeast of Virginia City. Going south from them about one and one half or two miles, and in the open bottom lands on west side of the Madison Fork, we found a singular series of remains, the use of which it is difficult to conjecture. These remains generally follow the edge of a slight step or terrace, of which Madison Valley offers numerous examples that extend for miles on each side as regularly as if artificially constructed. The remains are small piles of stones set at regular distances, sometimes connected by a

low cobble-stone wall now all in ruins, and noticeable only from their regular ridge-like form. Occasionally we find stone circles, stone mounds, though very small, but all regularly disposed on an uniformly conceived plan. In Idaho Territory we found some low stone mounds on the top of numerous high hills and mountains, but they represent no present use, except to mark signal stations, or occasionally a lone grave covered with the surrounding detritus and rounded boulders.—*Proceedings Davenport Academy of Sciences.*

THE LOST JEANNETTE.

At the meeting of the Boston branch of the United States Naval Institute, Saturday, Lieut. C. P. Perkins, of the Alliance, which ship went in search of the Jeannette, read his paper on the cruise, as asked for by the Institute. In alluding to the Jeannette, he spoke as follows: Whatever may be thought of the advisability of sending the Alliance into those waters in search of the Jeannette, subsequent events seem to have shown the wisdom of the proceeding, if for no other reason than a general knowledge of ice affairs in the Polar basin. When, on reaching civilization, news was heard on board of the Alliance of the high condition of the ice on the opposite hemisphere, the theory, or supposition, immediately adopted was that the whole Polar ice mass had moved over this year. Such a low condition of ice in the Atlantic has not been known before for forty years. Since this is the first year that Wrangel Land has been circumnavigated, it seems quite safe to say that the ice has never been so high on the opposite side. Is it not fair evidence that the mass has moved? While in contact with the ice during the entire month of August about Spitzbergen, the water temperature was never below 33°. Pools of water could be seen in the floating ice; snow and ice were melting on land, forming huge streams, running down the mountain sides. It is safe to say that miles of the ice was disappearing daily, and yet the place occupied by it was taken by other ice from the north.

In 1827 Parry made a sledge journey to the north from Spitzbergen, hoping to reach the pole. That journey, commenced June 21st, must have been similar to the one undertaken by the Jeannette party this year. Going over the same grounds many times he succeeded in making 100 miles by water, and 192 miles over the ice in thirty-one days, a total of 292 miles. Unfortunately the ice was drifting south all the time, so that the distance accomplished from his base of supplies, the Hecla, was only 172 miles. The height of latitude was 82° 45′. Where does this ice come from? It seems to me the question can be best met by the answer that it is by the drift of the entire ice mass. It is my impression that the northwest current found by the Rodgers and Corwin is the commencement of a vast one, which, going to the north, is deflected partially by the current to the east, found by Nordenskjold close to the continent, and continues in a northwest direction, taking the ice with it until it strikes Franz Josef Land, when it is deflected still more to the right, meeting Spitzbergen on the northeast

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coast, and, with whatever force it may have left, it escapes, assisted by the south current, on to the coast of Greenland, into the waters of the Atlantic. In other words, I believe there is a current in the Polar basin, acting in the direction of the hands of a watch. A reason for this impression is the fact that around all islands there is such a current, even to small detached islands, and all of the known ocean currents follow the same direction. Under this impression, I suggested that, though probably caught in the ice, the Jeannette had been probably carried to the northward and westward, and that, finding this current, DeLong would, if forced to leave the ship, raiher avail himself of its benefit by striking over toward Franz Josef Land than work against it by going to Siberia. The loss of the vessel in the given position affords some support to the theory, and the length of time taken for the boats to reach the main land, and the route supposed to have been taken by them, still more. The shortest distance to the main land from their position when crushed was 300 miles, hence an effort would be made to take course. Making their landing at the mouth of the Lena shows they were carried to the westward, and the length of time consumed, nearly 100 days, to my mind, is proof of a northerly, indeed, a heavy northerly drift. The distance of the scene of disaster from Franz Josef Land is only about 900 miles, and I venture to say that that 900 miles, with a well outfitted expedition, could have been made in at least the same, if not a less, number of days.—*Boston Herald.*

TIDINGS FROM THE POLAR EXPLORING COLONY IN LATITUDE 81 DEG. 44 MIN.

LETTER FROM DR. OCTAVE PAVY.

It will be remembered that Dr. Octave Pavy, United States Army, formerly of St. Louis, and who left Washington, D. C., for the Arctic regions on the Gulnare, in June, 1880, (which subsequently returned,) remained in Greenland until the arrival of the Government expedition under command of Lieut. Greeley, U. S. A., in July, 1881, which Dr. Pavy joined as Surgeon, U. S. A, and naturalist, at Godhaven, July 22nd, and with which he proceeded to Lady Franklin Bay, the future station of the signal party, and the base of operation for the land exploring party of which he is a member.

The many friends of Dr. Pavy in St. Louis—particularly the members of the Academy of Sciences—will perhaps be pleased to learn through a brief summary, of the coincidences and results of more than a year's abode in icy Greenland, and of the hopes, more fully counted upon by his past experience, for the coming year's journey toward the pole.

The Government has made the initiatory move toward Arctic colonization by the establishment of this party on the shore of Discovery Harbor, Lady Franklin Bay, in latitude 81° 44′ and longitude 64° 45′ W., to which selected

spot, as a signal station, a relief party will be sent each succeeding year in the early summer, taking new and well-fitted men to be substituted for those who may desire, for any reason, to return. Thus has been begun a bold attack upon the North Pole, which, for being yearly and methodical and slow, will, it is the thought, be the more powerful and sure in the end.

Senator Conger so wedded himself to the interest of this expedition last year as in a great measure to have been the instrument of its success. In his honor the place at which the house is built by the explorers, at Lady Franklin Bay, is called Fort Conger. It is believed by the friends of the expedition that the $300,000 promised as next year's appropriation will be granted and a new expedition sent off as early as the last. In this behalf it is urged as now more probable than at any earlier period that the Pole will be neared first by Americans, who with such steady and bold endeavor will not admit of final defeat.

Following the last news of Dr. Pavy, written in September, 1880, and communicated by the *Globe-Democrat* in January, 1881, was a letter written at Godhaven, (Disco Island,) Greenland, April 15, 1881, and sent by a Danish vessel via Europe, from which a few extracts of sentiment or travel have been obtained, as also some from letters of later date up to the return of the Proteus in September, 1881. "At last," writes the Doctor, "after eight long months of silence, which has remained unbroken by a word from the South world, where our interest and affection lies centered, we are expecting a vessel from Denmark which will bring truly according to song, 'tidings from afar.' How often, when perhaps 100 miles from any human inhabitant, in the desert of the Arctic, driving my Esquimaux dogs and sledge over rough and dangerous ice, surrounded by cliffs and precipices of death, I might truly say, have I become totally oblivious to these wild, almost unearthly, desolate scenes, and amidst cold, and snow, and piercing wind, have suffered my mind, always warm with imagination, to carry me back to the sunny South and St. Louis. In the dark days I have seen dark hours, mentally, for it is all but superhuman to conquer the melancholy power of a six-months' night, upon even the most buoyant spirit. Amidst the heat of this mental battle I have received almost a material comfort and ease of mind during the worst hours of anxiety, in reflecting upon what the end will be toward which the aggregate of these dark hours and unhappy fates will tend—a glorious gleam of scientific knowledge from out the darkness, which will light up a long unknown history of the Arctic North, and even enhance to me what is now most beauteous, the land where all is sun and light and civilization—the enlightened South.

"The sun so long obscure is climbing higher at this date, the days are waxing longer, and within a few weeks we will have news from that dear land where our hearts, if not our ambitions are. To us it has been an oft-repeated question, What has passed in the world during these months? Will any expedition be sent to Greenland for our aid or otherwise? What has been the fate of the gallant DeLong and the Jeannette? There is a feverish desire for news, which, in other regions where distractions and diversions are, cannot be conceived of. It is almost the fever of disease which would seem to bear itself into medicinal avenues

for treatment. The Governor, the Inspector, their assistants and the humbler Danes, all are thirsty for the arrival of the Danish vessel."

The Greenland settlements are very much alike, and consist of the residence of the Danish Governor or chief trader in the interest of Denmark, a large storehouse where the oil, skins, furs, eider-down and other products of the country are exchanged for the commodities sent out by the Danish Government. The Danes are open-hearted, good people, and are especially kind to Arctic travelers, so many of whom they have known as to be thoroughly versed in the history of travel in Greenland.

During every spring nearly everybody is attacked with influenza or pneumonia. This is a very interesting time to study the native, his habits and diseases, and the necessary modes of treatment, peculiarly moderated or intensified to suit this climate. This yearly spring epidemic spreads frequently over all the districts that have communication with Godhaven. It is believed to be brought by the whalers. Many Greenlanders die of it. Apropos to the term I have just used, little is known of the estimate put upon the word Esquimau by the natives themselves. They suppose that we use it to symbolize what is savage and cruel and uncivilized, and object seriously to the use of the term, and both prefer and use the name Greenlanders.

Practicing medicine as a matter of course, in Greenland, is simply a gratuity, but becomes a friendly *sesame* to the inner life and confidence of these simple but good people. The natives are much opposed and truly stubborn in regard to the use of medicine. On one occasion I insisted that some must be taken, when I was offered the same and perhaps the only encouragement the Esquimau could offer in the reply, "Well, doctor, how much will you pay me if I take it?" The Esquimau has quite an eye for beauty if in colored or pleasing forms. The Inspector's wife, a Danish lady of European education, on an occasion of a return from a pleasure ride, asked her maid who had her children in charge, to hold and carefully preserve a bouquet of flowers she had gathered to present her husband. The maid admired them exceedingly and a little later was asked why she had thrown them out of the boat. Her answer was that they were beautiful and that she had not thrown them away, but had eaten them. This was a devouring admiration of her kind, but not fully appreciated by her mistress. During the light months I made frequent visits by sledge travel to various places and settlements of interest.

My longest sledge journey was a circuitous one of 750 miles, taking in the settlements of Godhaven, Rittenbank, Egedismundi, Proven and Upernavik. I was drawn over the ice by about eighteen dogs and one companion—an Esquimau. We had some severe mishaps and many self-denials and wretched meals, at one time breaking through the ice and having to abandon a sledge and to find a new, which proved to be a long, winding route toward Godhaven. My cheeks became badly frozen and remained black for some length of time.

When I desired a new guide or any assistance one was furnished me most readily and generously, who had to drag his own sledge, too, through the unceas-

ing hummocks of ice. In all my travels I had constantly the main object in view, to gather supplies of all kinds for the coming United States expedition, of which I had word through European mail. I was collecting dogs, sledges, clothes, dog food, or gaining promises for the same, and so far won the friendship and confidence of the Esquimaux who could be useful to an expedition, as to have obtained in advance their promise to go as guides whenever I called for them after the expedition arrived. This premature work will certainly be of incalculable value to our expedition in point of time saved, as it will doubtless be a necessity for them to hasten toward Lady Franklin Bay, not only that they may reach there themselves, but that the ship may return to the States before the ice could close them in; hence there would be little time for search of provisions, dogs, natives, etc.

I will have by the date of the arrival of the ship all that can be collected or promised between Godhaven and Upernavik. I have had a quantity of clothing of the warmest and best fur made for myself and the sledge party who will be exposed to the rigors of winter by sledge travel. I crossed the Strait of Waigat, about thirty miles. It separates the main coast from the Island of Disco. After camping one day on the shore of the island, on account of the weather, which was too rough for a whale-boat, I proceeded toward Godhaven, where I expected to await the coming United States ship. This strait is peculiarly striking and has heretofore been grandly described by another.

After leaving this poetical spot we pulled to the oars all night, and in the morning, while turning a point about two miles from Godhaven, saw the three masts of a ship, and very soon the smoke-stack appeared. We gave three cheers for the American expedition, which we were certain this must be. An hour more and I was aboard—after a long, dreary year, once more with companions from home—with letters in hand, gifts spread before us, fast-repeated messages and greetings, making din and confusion about us. Few will have known the joy of such a meeting and such awful gloom and dreariness of abode and heart.

The Proteus surprised me in its early arrival, as it will every one conversant with the ratio of travel heretofore in this region. McClintock, in search of Franklin, was detained a whole year by ice in this locality, and scores of whalers and expeditions have been lost or delayed fatally at this point. The Proteus had been waiting for me two days, while I expected to have several days or weeks to await her arrival after this date. This trip is a good proof of the progress which can be made by persistent effort in overcoming certain seeming retrogrades, because of disappointment of season and unfavorable ice, which must, and is proved, will be favorable at times, and can then be taken advantage of (as in this case), if science is seeking the open *sesame* every year, regardless of discouragements and past failures.

After reaching the Carey Islands two parties went ashore, myself and Lieut. Kislingbury, to the cairn erected in this island, the most southeast of the group. Commander Greeley and Lieut. Lockwood walked along the shore to the depot of provisions, placed here at the same time by Capt. Nares, of the English expe-

dition of 1875. The novices of the party were quite astonished to see "red snow" on shore, which, in this case, was not very crimson, but by this time a common sight to me.

Soon after passing Cape Alexander, which, with Cape Isabella, forms the entrance to Smith's Sound, we found ourselves at Lyttleton Island. An officer and myself with some of our men started for "Lifeboat Cave" in the whaleboat, about eight miles in the distance, but from the clear sight of it, seeming, as usual, to be very near. At this point Buddington and part of the Polaris party passed their second winter after the death of Capt. Hall. We found several relics of the Polaris' camp and took pleasure in sending them to some of the party now in Washington. At Cape Hawkes, while Commander Greeley and an officer went ashore to inspect the rations deposited here by Nares, I went with Lockwood to Washington Survey Island, which lies opposite. We were obliged to separate, after much difficulty in landing at all, because of overhanging "ice-foot." I took the west end of the island and Lockwood the east. We had to climb to the top of a summit.

On the top of that which Lieut. Lockwood mounted he found the Nares cairn and the record inside. He took the original and left a copy, with also a record of the Proteus' movements. We found the ship getting under way when we returned breathless and fatigued by our necessary haste.

When we were off Cape Lieber, about Cape Baird, which makes Lady Franklin Bay, we found the ice of impenetrable character, and were obliged there to halt. Commander Greeley and myself went ashore at Cape Lieber. The high cliff that forms this cape is almost perpendicular on the side facing the sea, and is about 2,500 feet in height. From this point a grand view was before us. Polaris Promontory, the entrance to Lady Franklin Bay, Petermann's Fiord, Bessel's Bay, all like a panorama of grandeur in variety of proportion, spread before us. It was also where Hayes opened his eyes upon the open polar sea. The cairn he mentions having erected could not be found. The ice, which, was so dense as to wholly impede our further progress one day, upon the following left the way clear to our travel through the influence of a strong southwest wind, which always has the same effect.

Soon after this most fortunate occurrence we were at Lady Franklin Bay, in Discovery Harbor, and prepared to raise the house upon a spot to be called Fort Conger, which is the first signal station of the colonization party, and the future headquarters of many land-exploring parties.

Every man, with unwonted energy, assisted in unloading the Proteus, that she might the sooner return south.

The photographer of the expedition, and the jovial man of our party, seems to have had quite an unusual visit in point of time and interest to the hut of a native Esquimau, who lived in the primitive style. His description of the same is worthy of the quotation I ask of him for the *Globe-Democrat*, my home paper: "At Proven a better opportunity for studying the habits of the primitive Esquimaux was afforded than at any other place we have visited. The whalers and

exploring parties seldom visit it, and the influence of the white man is less perceptible. They retain their habits of life as practiced before the general condition of the race was improved to a great extent in other parts of Greenland. I spent four hours consecutively in one of their least attractive 'igloos' or huts.

"My pretext for so protracted a stay was ostensibly awaiting the completion of a cap of eider-down, on which one of the squaws was engaged. The hut was built of turf, moss and stone, and was entered by a long, narrow, low passage or tunnel—so low that I was compelled to crawl on hands and feet, a most disagreeable and humiliating proceeding, as the dogs and natives (not much better in point of cleanliness) also have ingress and egress through the same vestibule. On reaching the small interior hole which was the entrance to the living, eating and sleeping-room, the first glance revealed the mistress of the house, in an extremely airy costume, sitting on the shelf or platform on which they sleep. By due process of barter a neckerchief that I had worn was transferred to the possession o the squaw in exchange for the eider cap to which I referred, and which she at once proceeded to make, first measuring the dome of my intellect with great precision.

"The room was too low to admit of standing upright. No stove or fire-place appeared; as a substitute there was a hollowed stone, used as a lamp, with seal-oil for fuel and moss for a wick. The atmosphere of the room was stifling and extremely nauseating from the odor of seal-skins strewn around. The sleeping arrangements were most simple—a platform about two feet high and extending from the wall about six feet occupied one side of the room. This is the receptacle of skins and furs during the day, and when the natives retire they make it a general couch, each disciple of Morpheus drawing over himself or herself so many of the skins as are necessary for comfort.

"The costume of the Esquimaux women is so nearly like that of the men that at first glance it is difficult to distinguish the sexes. The women, however —as all the world over—dress in a more pleasing manner than the men. The costume generally consists of a pair of dainty boots of dressed seal-skin, stained different colors and ornamented with small pieces cut in fancy forms, which reach above the knee.

"Then come the trunks, or pantaloons, also of seal-skin, but with the long hair on. This garment is very short, reaching hardly half way down the thigh, when they meet the boots or leggings. The upper part of the body is covered by a loose-fitting cassack or smock, devoid of buttons, which is pulled on over the head. An attached hood can be drawn over the head or allowed to fall back on the shoulders at pleasure. A pair of the afore-mentioned trunks, or pantaloons, was the only part of the costume which the dusky maker of my cap saw fit to wear. She appeared to work with greater facility, however, than if trammeled with clothing, as she deftly held the materials in position with her toes while she trimmed or fitted them. Two or three children were hanging about her, without seeming to impede her progress in the least. As soon as completed she placed the cap on my head, and proved at once the possession of at least one

quality in common with her more civilized sisters, of being able to flatter by showing in gestures and expressions great admiration, but whether for her handiwork or our appearance we could not determine, but I at once was reminded of the remark of the descendent of Israel: 'It fits you like de paper on de vall.' I was indeed glad to escape from the unfragrant place. The single window was made of the membraneous tissue of the stomach of the seal. This substance when oiled becomes almost as transparent as glass. Many of the natives, however, live in far better dwellings than the one I have described. Such a one represents the habitations of the poorer classes."

During my year's stay among the various settlements as far south as Egedesminde, and north as Upernavik, whether practicing as physician, when I could thus do good, studying to verify my theories of the science of this region of mystery, or traveling over the ice needing aid and companionship from the inhabitants, I have had in every degree the co-operation and constant attention of the Danish Governors and the Inspector of Greenland and the kind assistance of any Esquimaux of whom I chose to ask favor. It would be a difficult thing to stay here for study and travel if it were not for the uniform courtesy extended by the Danish officials. They are gentlemen of more or less European education, and appreciate work done in the interest of science.

It is not necessary to mention the full collection of animals, birds, eggs, specimens of all kinds I was enabled to collect. There is an abundant room for study here. Of the prehistoric age there is a world of interest open to the student. Ethnology is a branch of especial interest to me, and was made, with the study of land formations, coal seams, etc., a subject of devotion and rare pleasure in point of interest. Botany, even, is pleasant and novel, and it gave me peculiar delight to make a botanical collection, because I felt that in that I would have the appreciation of the eye by those at home.

A letter addressed to Dr. Pavy by "Krarup Smith, Inspector in North Greenland"—there are Smiths so far north, it seems—is a tribute by that Danish official to the professional services of the Doctor and his zeal in the northern exploration, for which, he adds, he is well outfitted. It is dated Godhaven, July 13, 1881, and written in excellent English, as well as perfect in penmanship. This official has a family who lives at Godhaven (Disco Island), and is a man of information, education and politeness. Though his yearly association with explorers who have gone north within the fourteen years of his service there, he is well versed in Greenland travel and Arctic matters in general.—*Globe-Democrat.*

THE LATEST EXPEDITION TO THE LENA.

The Russian expedition to the mouth of the Lena, organized by the Imperial Society of Geography, which left St. Petersburg the 28th of December, will pass a year on the coasts of the frozen ocean. In sending this expedition the Society fulfills the obligation contracted toward the International Polar Commission. The following States take part in the enterprise projected by the Commission:

1. Austria—One station at Jan Mayen Island.

2. England—One station at Fort Simpson.

3. Germany—Two stations; one on the Gulf of Georgia, the other a place not yet decided upon, in the region of the North Pole.

4. Denmark—One station on the western coast of Greenland.

5. Norway—One station at Altengaard, in the province of Finnmark.

6. Russia—One station at the mouth of the Lena.

7. The United States—Two stations; one at Point Barrow, on the east of Behring Strait, the other at Lady Franklin Bay, Greenland; the latter is already in operation.

8. France—One station at Spitzbergen.

There are nine other stations in the Arctic region and two in the Antarctic region. There is every reason to believe that there will be one or two additional Arctic stations. These may swell the list of persons engaged to over 200, all taking active parts in this enterprise, which will cost altogether a million rubles. If it be considered that besides all this the magnetic observations in the more southern regions will be immensely stimulated, the importance and costliness of the enterprise will be fully appreciated.

The Russian expedition will undertake the heaviest part of the work. It will have to traverse about ten thousand versts (6,630 miles) and establish itself in an exceptionally cold region at the mouths of the Lena close to the place where the lowest temperature in the world has been noted. In January the average temperature is 40° below zero, the point at which mercury freezes. The greatest precautions will, therefore. have to be taken to prevent the members of the expedition from losing their lives. It may be presumed that fortunately the survivors of the Jeannette boats, who were living at the end of October, according to the news of them received a fortnight ago at Irkutsk, will have been transported ere this to a more hospitable clime by the people with whom they had taken refuge.

ANTHROPOLOGY.

THE PREHISTORIC COPPER IMPLEMENT QUESTON.

BY PROF. H. A. REID.

In my history of the State of Missouri, published by the Missouri Historical Company, the first chapter is devoted to "Prehistoric Missouri;" and in speaking of the mound builders I use this language: "They had no knowledge of iron, nor any art of smelting copper; they merely took small pieces of the native ore and hammered it cold with their stone tools until it took some rude shape of utility." After this was published my attention was called to Mr. Conant's state-

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ment in a volume which is deemed the classical, or *standard*, history of the Iron Mountain State. This book is the joint work of Prof. Swallow, the veteran scientist of the State University, at Columbia; Col. W. F. Switzler, the learned editor of the Columbia *Statesman;* and A. J. Conant, of the St. Louis Academy of Science. In this work Mr. Conant said of the mound-builder: "It has been stated, and often repeated, that they had no knowledge of smelting or casting metals, yet, the recent discoveries in Wisconsin of implements of copper cast in molds, as well as the molds themselves, of various patterns, and wrought with much skill—prove that the age of metallurgical arts had dawned in that region, at least."

I naturally supposed that Mr. Conant had knowledge of later facts and evidences than I had, and hence in my article in the REVIEW of November, 1881, page 406–7, in speaking of the tiny copper-ax relic which I had found at Lexington, Mo., I cited Mr. Conant's statement and presumed it to be correct. But, in the REVIEW for December, page 490, appears a letter from Prof. F. W. Putnam, of Cambridge, Mass., sharply criticising my article. I am also in receipt of two letters from Dr. P. R. Hoy, President of the Wisconsin Academy of Sciences, referring to the matter, and he writes: "The quotation relating to molds and cast implements of copper found in Wisconsin is entirely incorrect. I have received a note from Mr. Conant in which he says flatly that he was mistaken; and he could give me no answer as to his proof of the loose statement. * * * I think it too bad that such an error should become wide spread."

Prof. Putnam is Secretary and Curator of the Peabody Museum of Archæology, at Cambridge, Mass., and, hence, ought to be an expert in archæology, which I do not profess to be. But I will cite the essential points of his critique, and perhaps be able to throw some light on the subject. Prof. Putnam says:

1. "May I take the liberty of asking why he (Prof. Reid) thought the ax was cast, and not hammered into shape?

2. "Can any one give an account of the molds found in Wisconsin? What were they made of, and where are they now?

3. "Every statement of the melting and casting of copper by any people in North America, outside of Mexico, before European contact, must be taken with due caution.

4. "I have not seen a single object made of copper from these sources that I should regard as having been cast; on the contrary, the evidence of hammering, and rolling between stones, is more or less clearly shown in all by the character of the surface and by the distinct lamination of the metal in places, when carefully examined with a lens."

Reply to No. 1. Because it *looked like* a casting; the surface has a free granular quality or grainy roughness, just like coarse iron castings molded in sand, or the toy trinkets which boys sometimes cast from lead or pewter in a mold whittled with a jack-knife in two pieces of soft silicious shale. It shows no spot, dent or mark that looks as if it had ever been struck with a hammer of any sort.

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Again, the surface of fracture shows at least two places that look as if gas or air bubbles had occurred there when it was cast and thus made a weak place which ultimately led to its being broken. And again, there is no "evidence of hammering" from any "distinct lamination of the metal in places," as Prof. Putnam expresses it. The shape is more artistic and perfect than would be likely to be produced by free hammering. These are some of the chief reasons "why he thought the ax was cast, and not hammered into shape."

The specimen was exhibited at the November meeting of the State Academy of Sciences, of Des Moines, Iowa, and the report of that meeting in the *Daily State Register* said: "Prof. Reid exhibited some mound-builder relics, one being a fragment of a tiny copper ax which he had found in connection with fragments of ancient pottery, flint-chips, arrow-heads, etc. This elicited a good deal of interest and was tested with acids by Messrs. Carey and Bailey, who found it to be pure copper. Some thought it had been molded, while others thought it had been hammered out from a piece of native copper."

Reply to No. 2. Dr. P. R. Hoy, of Racine, Wisconsin, in "Transactions of the Wisconsin Academy of Sciences," Vol. 4 page 136, says: "Some of those implements that have been supposed to be cast were, I think, swedged; that is, a matrix was executed in stone, into which the rudely fashioned copper was placed, and then by repeated blows the article would be made to assume *the exact shape of the mold.*" Again he says: "I am persuaded that, in a few instances at least, *there was a complete mold* worked out in halves, on the face of two flat stones, so that by placing a suitable piece of copper between them and giving it repeated heavy blows the copper was *made to fill the mold* accurately." The Doctor then recites at some length how he once found such a mold or "slight excavation on the face of a large granite boulder;" but in attempting to chip it off it was broken all to pieces. And an editorial foot-note to Dr. Hoy's paper says: "Dr. Butler, who was present, has held strongly for the *casting* of these copper tools."

So here we have quite sufficient ground-work for Mr. Conant's general statement; and I remember to have seen articles about these Wisconsin discoveries of *stone molds* and *molded copper implements* going the rounds of the newspaper press two or three years ago. Men on the ground seem to have differed, at least in regard to some of them, as to whether the copper had been melted or worked cold; but, in either case, it is admitted that molds were used.

Reply to No. 3. In this item Prof. Putnam himself virtually admits that the pre-European inhabitants of Mexico did smelt or cast copper. And on page 126 Vol. 4, Wisconsin Transactions, Dr. Edmund Andrews, of the Chicago Medical College, says: "They (the mound-builders) were miners and coppersmiths of considerable skill, but apparently wrought their metal solely by hammering; yet they occasionally had *molten bronze chisels*, which they probably imported from Mexico. They possessed shells from the sea, plates of mica from the Alleghanies, and obsidian from the Rocky Mountains. They probably sent copper to

Mexico, for in the graves of Yucatan have been found beads of the Lake Superior chlorastralite."

Again, at the fourteenth annual meeting of the Kansas Academy of Sciences, Prof. Snow, of the State University, gave an account of his own recent "archæological explorations in the Pecos Valley, New Mexico." Among other things he said: "On a hill opposite the church they found specimens of pottery of the most ancient type, and also specimens of more recent origin. In one locality they found *specimens of slag* (the refuse from smelting) and indications of supposed mining shafts. The supposition was that these were evidences of mining by the ancient Pueblos." And on page 481 of the REVIEW for December, 1881, I find Columbus Moise, of Las Vegas, New Mexico, making this statement: "The remains of *furnaces*, and such rude means and vessels as the primitive races used in mining, may yet be found scattered about in many places, showing conclusively the existence of mines which paid, even with their rude methods. All implements found are of either stone or copper; the *furnaces*, of mud and rock."

Now, all this goes to show that not only the ancient inhabitants of Mexico, as Prof. Putnam admits, but also the Pueblos of New Mexico, *melted copper* and made implements of it.

Reply to No. 4. My specimen found in Missouri has the external appearance of having been cast. Prof. Putnam admits that copper was anciently cast in Mexico. Later discoveries, as above cited, show that copper casting was also done in furnaces by the ancient Pueblo inhabitants of New Mexico; and if so, is it not at least possible, and reasonably probable, that it was also done in some other places—in Wisconsin, for instance—even though we may not yet have found any all-convincing proofs on the subject. Some intelligent observers think it was. Moreover, my specimen may have come either from the Mexican or the Pueblo artists, instead of from any kind of copper smithery in Wisconsin. But let it be understood that Wisconsin, or the Lake Superior region, is not the only place where copper exists, for the State of Missouri has plenty of it, and in every variety of ore. It has been found in that State in the following counties: Dent, Crawford, Benton, Maries, Greene, Lawrence, Dade, Taney, Dallas, Phelps, Reynolds, and Wright. And in some parts of the State, especially of the Ozark region, remains of very old mining work and furnaces have been found, which some observers suppose to have been pre-historic, although the majority thus far attribute them to the early Spanish adventurers. It is claimed that some of De Soto's army spent the winter of 1541–42 in Vernon county (southwestern part of the State), the chief evidence being that very old, rude smelting works or furnaces have been found there. But it is just possible that these works may have been prehistoric, the same as those of the Pecos Valley and other places in New Mexico. The archæology of Missouri, like her mineral wealth, is only in the infancy of its development and I quite suspect that prehistoric mining and metallurgy will yet be identified within her borders, in addi-

tion to the two-or-three-centuries-old works of Spanish and French adventurers, to whom it has been the fashion, hitherto, to attribute anything of that kind.

The foregoing article was read at the December meeting of the Des Moines Academy of Science, for criticism, suggestion, or amendment. The copper relic in question was subjected to more thorough examination with various styles of magnifying glasses which were at hand—mostly pocket-instruments, such as physicians usually carry for ready convenience. And the conclusion was practically unanimous that the ax *had been made in a mold*, but by the process of cold-swedging a piece of native copper, and not by melting it. The rough, grainy surface, that looked and felt so much like a casting, was thought to have resulted from oxidation; and the appearance of air-bubbles in the line of fracture was thought to have been an original flaw in the ore.

The next day I took the relic to Dr. E. H. Carter, Dean of the Iowa Electric Medical College (medical department of Drake University), and examined it with a magnifying power of eight hundred diameters. Dr. Carter, who is one of our Academy members, but who was not present at the meeting, first detected spicules of vitreous quartz imbedded in the copper. I afterwards verified his discovery, and also found several others; they were so fine that no hand magnifier would reveal them at all, but under this high power they were as plain as quarry stones; and here was further proof that this piece of copper was pure native ore, which had never been melted by man. We detected also a crease or depressed wrinkle that had been produced by the compression or crowding together of the surface of the metal.

Conclusions.—Out of all this investigation I evolve the following summary:

1. Prof. Putnam's statements and criticisms were altogether too general—were even obnoxious to his own strictures; for he did not discriminate between *free-hammering* and *swedge hammering* or pounding, in the matter of different modes by which our ancient stone-folk worked copper. And he did not discriminate between *molds for swedging* into shape pieces of cold native copper, and *molds for casting* molten copper.

2. If Dr. Hoy reports him correctly, Mr. Conant admitted in his letter more than the case required.

3. The evidence in regard to pre-historic furnace-work is not all in. There are some "connecting links" yet to be discovered.

4. I reverse judgment and correct my error. My copper ax was not cast from melted copper, but was shaped by the process of cold-swedging in a mold or matrix worked into some kind of very hard stone.

DES MOINES, IOWA, December 15, 1881.

OUR POSSIBLE LEMUROID ANCESTOR.

In the January REVIEW we re-published from the Philadelphia *Times*, under the title "The Missing Link," a reporter's statements respecting the recently found lemur *Anatomorphus Homunculus*, from the Wasatch beds of the Big Horn. Naturally these statements were somewhat loosely made, and we gladly copy from the *American Naturalist*, for January, Professor Cope's own description.—[ED. REVIEW:

AN ANTHROPOMORPHOUS LEMUR.—The stock from which the true quadrumana have been derived, is supposed to have been the lemurs, but no type of that sub-order has hitherto been found which presents any near resemblance to either of the four families of monkeys. The two inferior families *Cebidæ* and *Hapllidæ*, agree with most of the *Lemuridæ* in having three premolar teeth, but those of the upper jaw generally have well developed internal lobes like the true molars, while most of those of the Lemurs have none. One group of Lemurs, the *Indrisinæ*, agree with the higher monkeys in having but two premolars, but these also are only one-lobed.

A nearly perfect cranium of a species of *Anaptomorphus* Cope, shows that this genus had but two premolars in the superior series, as in the *Indrisinæ*, but that they are two-lobed, as in the *Simiidæ* and *Hominidæ*. Of these two families, the *Hominidæ* is the one to which *Anaptomorphus* makes the nearest approach in dental characters. The canine is small with a crown little longer than those of the premolars, and is not separated from the latter or from the incisors by any appreciable diastema. All but one of the superior incisors are lost from the specimen, but those of the lower jaw, which I discovered in 1872, were nearly erect as in man and the *Simiidæ*, and not procumbent as in most Lemurs. The cerebral hemispheres are remarkably large for an Eocene mammal, extending to between the middles of the orbits; the anterior parts, at least, are smooth. The cerebellum projected beyond the foramen magnum posteriorly, as in *Tarsius*. The orbits are large, approaching those of *Tarsius*, but are not so much walled in by a septum from the temporal fossa as in that genus. The superior molars have only one internal cusp.

The species, which I propose to call *Anaptomorphus homunculus*, has a wide palate, much as in a man, and the true molar teeth diminish in size posteriorly. The pterygoid and zygomatic fossæ are short and wide, and the petrous bone is large and inflated. The animal was nocturnal in its habits and was the size of a marmoset. The genus is nearer the hypothetical lemuroid ancestor of man than any yet discovered.—*E. D. Cope.*

ENGINEERING.

THE TEHUANTEPEC SHIP-RAILWAY.

Captain Eads' new bill will be presented to Congress very soon with a few important changes likely to render it more acceptable than before. As explained by Capt. Eads himself, these changes are as follows:

"In the first place, in consideration of the guarantee which we ask from the Government, the Ship-Railway Company agrees to transport vessels belonging to citizens of the United States or Mexico at one-half the established rates both for passengers and freight. Secondly, the Ship-Railway Company agrees that if at the end of ten years, it should be found that the earnings of the road will pay more than eight per cent dividends on its capital stock of $75,000,000, the Company will, at the request of the United States Government, reduce its rate of tolls so as to keep its dividends down to eight per cent. Thirdly, the Ship-Railway Company agrees that at any time during the existence of the guarantee (which expires in fifteen years) if the Government elects to guarantee six per cent dividends on the entire stock of the Company, it will carry the ships of the citizens of the United States across the Isthmus without any charge whatever."

He further said in regard to the discrimination proposed between the vessels of the United States and other countries;

"Careful estimates have been made by able experts in England, which establishes the fact beyond question that the cargoes of fully loaded ships can be transported by railways across the Isthmus at seventy-five cents per ton. During the past season from $19 to $21 per ton have been paid as the ruling rates on the grain from California to Liverpool by way of Cape Horn. Some of the owners of the ships engaged in this trade have assured me that they would cheerfully pay $6 or $7 per ton for crossing the Isthmus. The road could make handsome dividends by charging all vessels, except those of the United States, $3 per ton, and half that price on our own ships. The commerce of the world, at that price, would be immensely benefited, while the discrimination in favor of American commerce would act as an immense stimulus in restoring our ocean marine to its former magnitude. I have no doubt that if American commerce were carried absolutely free, $3 per ton on all foreign commerce requiring the use o fthe Ship-Railway, would be amply sufficient within five years after the completion of the road to pay six per cent dividend on its capital.

"If the United States assumes to exert a controlling influence over the American Isthmus, one of the strongest measures it can possibly adopt to sustain such a position will be the prompt encouragement of the construction of an American ship-transit by American enterprise, and in American interest. She cannot maintain the respect of the world at such a period as this if she places any

impediment whatever in the way of Comte de Lesseps without at the same time responding to the universal demand for a passage through or over this great natural barrier to the commerce of the world.

"My visit to England last August satisfied me that every dollar which is required for the work will be subscribed there within sixty days after the United States declines my proposition; but I have no fear whatever of its being declined by the Government. The concession which Mexico has given to me is so comprehensive and liberal that it enables me to give such advantages to the United States as cannot fail to be acceptable.

"The private capitalists who are engaged to-day in England in transporting the immense crops of California and Oregon would construct the ship-railway at once if I would consent to have them control it. Such a result would put the finishing stroke to our ocean commerce. They would have at least the absolute control of the carrying trade between our Pacific possessions and Europe.

"There are very few intelligent people to-day in either England or America who have any doubt as to its practicability. I have received within the last three days from England several letters from the very highest possible authorities upon such subjects, fully indorsing the entire practicability of the ship-railway. One of these letters is from Mr. Barnaby, the present chief constructor of the British navy, another one is from Mr. William John, the chief manager of the ship-building establishment that has just finished the City of Rome, the largest vessel afloat in the world except the Great Eastern; another is from Mr. Pearce, the sole owner of the works which build the White Star steamers. Mr. John was for many years the scientific adviser of the Committee of Lloyd's Register in London, a position requiring the highest possible expert knowledge of the science of ship-building. Another letter addressed to me is from Emmerson, Murgatrayd & Co., the builders of the Bombay docks which were designed to take out the Great Eastern, and which lifted 10,000 tons vertically. They were the builders of the Malta Docks also, and they offered to build the works which I need at each end of the railway on the same terms that those works were built upon, and to lift with absolute safety the largest loaded ships forty-six feet high in thirty minutes, ready for transit over the railway. Another letter sent to me from England is a copy of Sir Edward Reed's reply to the request of Admiral Ammon, of the United States navy, giving his views on the relative merits of the Nicaragua canal and the ship-railway. The letter is the ablest essay in favor of a ship railway that has yet appeared. Sir Edward was formerly the chief constructor of the British navy. He has probably had more experience in ship-building, docking and repairing ships than any man in the world; has written several treatises on ship-building, and has been knighted by the Queen of England in recognition of his eminence. I have other letters from a number of other gentlemen in England equally as distinguished as those whom I have just mentioned, but my proposition to Congress really leaves the question of practicability beyond discussion, for the guarantee which I ask is not to take effect until the practicability of the ship-railway is demonstrated absolutely."

CORRESPONDENCE.

SCIENCE LETTER FROM PARIS.

PARIS, Dec. 17, 1881.

Public attention is daily becoming more intensely fixed on the subject of railway brakes and signals. Since a long time specialists have been studying systems of continuous brakes, that is to say, a plan of operating simultaneously on several carriages. It is not a little singular, that from the first, electricity was designed as the agent; as M. Achard, in 1858, proposed an electric brake for the Great Eastern of France. In 1860 Messrs. Tremblay & Martin took out a patent for the employment of compressed air as a motive power to regulate the rapidity of locomotives and railway carriages. The trials were not successful. From 1861 to 1872 efforts were made to group uncontinuous brakes as patented by Newall, Clarke, Heberlein, etc. In 1872 the Westinghouse brake was introduced into Europe from the United States; next succeeded the Smith plan of rarified air. Between these two systems, and neither of which is perfect, engineers had to decide. The Smith patent, which was the Tremblay & Martin idea, possessed the advantages of being simple, had no delicate or complicated mechanism, was easily constructed and repaired. But it had the drawback, that the force exercised by the brake could not exceed the pressure of one atmosphere. In the Westinghouse plan, a greater pressure could be employed, since the agent being compressed air, several atmospheres could be utilized; it also presented the advantage of pulling up more promptly masses of matter animated with a grand momentum. But the fear existed, that the valve which gave passage to the compressed air, was too delicate and very difficult to repair; hence, authorities are nearly divided into two camps, with the balance of the opinion in favor of the Westinghouse brake. However, experience showed the latter could spontaneously get out of order, and suddenly cause a train to come to a full stop; then to resume travelling, it was necessary to undo the brake from carriage to carriage. Further, it was not a *moderateur* check, obedient to the engineer, when descending a decline, etc. Since September last, M. Henry, of the Paris-Lyon Railway, has remedied these defects. A question that the engineering world has yet to agree upon is: Ought brakes to be automatic? The system has the advantage of telling itself, by stopping; but the stoppages arrive so frequently as to counter-balance superiority over the other systems. In France, the leaning is at present decidedly in favor of the Westinghouse, which represents an important progress since twenty years; but where may it be in another score of years?

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Closely connected with the solution of assuring the maximum of security in railway traveling, is the question of signals; these must not be only visual, easily read by the driver, but the faithful interpretation of electric signals; they must not be too numerous, in order to afford the means and the leisure to be readily perceived, and not induce undue confidence. Between the look-out for signals and keeping an eye on the line, attention to brakes, and the new system of furnace Belpaire, requiring only thin layers of combustibles, both driver and stoker have serious responsibilities and no small anxieties.

The visual signals are the colored disks and the semaphores with ascending and descending arms; there are also electric signals between each signal post, to indicate when a block of line is free or closed. But they are the first only that speak to the driver's eyes. Efforts are made to marry the two systems, and the accepted idea is, that electricity ought only to be employed to efface, not to make, the visual signals. And despite every perfection in point of view mechanical, and with fairly worked, intelligent and well paid employees, human fallibility will ever exist as the cause of a certain number of accidents. The very perfecting of mechanical contrivances is in itself a danger, as it begets an undue confidence of security. A servant can wire the departure of a train, but forget to display the stop-signal to guide the driver of a following train. The problem to solve is to secure the two warnings by one and a simultaneous movement. M. Lartique. of the Great Northern of France Railway, appears to have succeeded; at a station, the man displays the arm signal to stop, and it is by an electric current from a station further on, that liberates the arm of the semaphore, indicating the train has left and the way is clear. If by chance the electric current failed, etc , all that could result would be a delay in the succeeding train.

Lead-intoxication can be produced by a very small dose of that metal introduced into the system; its symptoms are recognized by intense headache, colic, nervous irritation, pain in the kidneys, paralysis, etc. It seems we live in an atmosphere of lead; it is everywhere present, although invisible. Thus M. Gautier, an authority on lead-poisoning, exhibits that insiduous poison in walls, wool, leather, clothing, water, the siphons for seltzer water, the crystal flacons for Orleans vinegar, in white wine bottles, in tinned food, such as preserved vegetables, sardines, lobster foie-gras, tunn, etc. However, neither the emanations from house-painting, nor the salts of lead employed to prepare leather or dye-stuffs, can be a source of serious danger; in the tins of preserved vegetables, the quantity of lead absorbed is feeble, though the solder contains seventy-five per cent of thct metal. The matter is more serious in the case of sardines or food preserved in oils, or abounding in fat; here oleate of lead is formed and increases in proportion to the time the aliment has been boxed up. The French Government has prohibited the internal soldering of sardine cans, but two years must elapse before the stocks on hand can be used up. In the meantime the French contractors for the navy, have to supply the new prepared sardine-boxes. After sardines rank *foies gras* and lobster; the former can be had readily in earthenware

pots; as for the latter, they contain less lead poison than sardines or fat liver. Siphons are only dangerous when allowed to rest on the side, and drinking-water suffers no injury in leaden pipes so long as it keeps flowing.

M. Hement draws attention to the fact, that when the dumb are trained to speak, they do so in the accent of the locality where they have lived; but M. Blanchard denies the fact: there is no *patois*, but a uniformity of croaking, metallic pronunciation; a series of mechanical, muscular efforts, having nothing in common with any known accent, but sufficiently intelligible to be comprehended between the speakers themselves. M. Coeljo, a Portuguese gentleman, asserts that the creoles have *patois* so distinctly peculiar, that it remains ever the same, whether pronounced by a Hindoo, Chinese, negro, or Red Indian.

M. Alphonse Milne-Edward has drawn attention to the resistance of certain animal-germs. In the environs of Paris, after unusually heavy rains or inundations, quantities of crustaceæ, called *apias*, are to be found in old cartruts, hollows, and ditches; dry and warm weather ensues, the water in these places evaporates, the apias disappear, no trace of them can be found till like inundations ensue; then new generations spring into existence, which, too, in time also disappear. Siebold has demonstrated that the eggs of these infusoria could, pending several years, preserve their germinating power. M. Certes, in 1878, evaporated some of the saline water in the province of Constantine, Algeria, and preserved the dry sediment till April, 1881, when he placed the residue in filtered rain-water; soon numerous infusoria were developed, and also several larvæ, presenting all the characteristics of the animalcules peculiar to the water originally taken from the pool. The French Government commissioned M. Alphonse Milne-Edward to execute some methodical dredgings in the Mediterranean, and which he has recently concluded. The results are interesting and curious; specimens of low organizations of life were plentifully discovered at depths of 1100 and 2800 yards: one species was found almost blind, since its eyes were deprived of pigment. At a mean depth of 275 yards, the temperature of the Mediterranean is constant, between 32° and 53° F.; this fact explains the little development of life in the depths of that sea. Further, the Mediterranean is isolated in a life sense from the Atlantic by the Straits of Gibraltar, which form as it were an impassable bar. However, all the beings that occupy the depths of the great island sea arrive from the Ocean. Another circumstance which militates against development of life is the absence of rocks, or the vast depots of sludge which cover them, rendering the conditions for swarming most unfavorable.

Following up these details, M. Blanchard gave explanations, that the Mediterranean is a sea of only recent formation, anterior doubtless to the historic period; indeed he would go the length of saying, its formation progresses still; he confirms the results obtained by M. Milne-Edwards, that life in the abysses of the Mediterranean is tenanted from the Atlantic, but goes on dwindling as we advance to the Orient; he added, that the flora and fauna of the north and south

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shores of the sea present analogous or identical species, following not zones of latitude, but those of longitude. The same phenomena is to be observed between Indo-China and the Sound Islands.

M. Quatrefages confirms the opinion of M. Lund, that the fossil man discovered by the latter in the Agna Santa Cavern, is contemporary with the species of mammoths whose remains have been found in bone-caves. In brief, M. Lund holds to the theory of fossil man, and which he maintains every day brings fresh evidence in support. M. Quatrefages himself has made a profound examination of the American skulls in the Natural History Museum, and pronounces they have a form generally analogous with those found in the Agna Santa cave.

M. Palsermacher has invented an apparatus for measuring the "doses of electricity" for invalids.

PHILOSOPHY.

AN APOLOGY FOR NATURE.

BY DAVID ECCLES.

Habits of thought, like habits of dress, are seldom suddenly changed. Most innovations, in inception, appear grotesque, and this fact is the bulwark of conservatism. A certain familiarity must be cultivated before any departure from established modes of action or thought is free from unthinking prejudice. We are all "custom made"—stereotyped in the matrix of our surroundings—and those most governed by antecedents generally least suspect it. Each individual, in the hallucination of an absolute freedom, feels himself above all law, past or present, whereas, his neighbors may observe he moves with the uniformity of an automaton and does all his thinking in an established groove. The electrolysis of social habits polarizes us all, and pre-determines our adjustments. Individual thought is but a small factor of modification; however accurate and true to Nature that thought may be. Predilection for, and pre-adjustment to, the old, makes us unconsciously sacrifice the truths of the new to a spirit of compromise. The evolution of all thought exhibits this tendency, and no department furnishes stronger illustration than that pertaining to law and miracle.

Time was when such a thing as uniformity of action, as applied to Nature, was never suspected. Nature was then as capricious as the caprice of the uncultured mind could reflect it. Gnomes, nymphs, sylphs, fairies, witches, spooks, angels, devils, gods and goddesses without end, filled heaven and earth, to the exclusion of all conception of law. Before physical science was born, "miracle" was the explanation of everything. It is a long way from these barbarous con-

cepts to our present mental altitude, but the connection is unbroken; and here, at least, the evolutionist is at no loss to discover intermediate links. All round him he sees the atrophied rudiments of obsolete modes of thought; while by historic research into the buried strata of forgotten tombs, he exhumes the perfected form in which these now inert rudiments had their functional uses.

A great system of speculative theology, born of the imagination, once filled the vacuum of human thought. Man must theorize; and, when destitute of knowledge, his theories are generally mere figments. In a world of mystery, ruled by mystery, by mystery held in awe, and quickened by the wakefulness of a savage dread, it is no wonder ignorance filled heaven and earth with weird fantasies. The impress of those wild fears is stamped on every living mind. Madame de Stael was once asked if she believed in ghosts. "No," she replied, "but I fear them." It is not difficult to understand the truth of this paradox. We are all heirs to an infinite heritage. Nature, to-day, is a compendium of all that has been. Modes of thought are accompanied in the material world with change of form. Form and memory or mode synchronize. Physiology perpetuates form, and form is indissolubly related to mental function. Therefore, are we all subject to emotions we can but poorly control. Many of us are still disposed to fear darkness and view unusual natural phenomena with a secret alarm. The prophetic end we have been taught to look for is always imminent. Only a fews ago, a comet was a harbinger of war; a meteoric shower a prelude to the final catastrophe, and an earthquake an overture to the day of judgment. Either of these phenomena to-day, in an aggravated form, would awaken the old alarm, even among the educated. We have the intellectual conviction of law, but without permanency as a mode of thought. It requires habit to secure us in the possession of any mode. If we rely on the energy of new thought to balance our actions we are doomed to disappointment. This requires coercion; while acts or thoughts secured by habit, are, in a measure, spontaneous.

The truth of this proposition finds daily confirmation. Most educated people give intellectual assent to the doctrine of law and uniformity in Nature. In diseases within man's skill to eradicate or modify; in catastrophes within our power to prevent; in all ordinary measures looking to material ends, we show decided confidence in natural sequence. But let an appalling and uncontrollable pestilence occur; subject us to a devastating scourge of chinch-bugs or grasshoppers; let there be an unusual and calamitous drouth; and an immediate stampede occurs to the old habit of thought, led off by the ignorant, but followed by all save a few philosophers. Prayer, which in times of intellectual and emotional peace, is used simply as the channel through which men find spiritual blessing, and would be considered a degradation of its use if made a means of asking material wonders, suffers complete reversal under the dire necessity of the situation. As one laboring under pain will try all sorts of exploded nostrums, that peradventure he may find relief; so, when humanity have exhausted all their power, it is but natural that they seek the protection of the Great Mystery behind the veil of phenomena.

XUM

The old conception—which extended to diseases and disasters now subject to human skill—that these things are sent as a token of Divine displeasure for man's sinfulness, is openly avowed; although, were this same explanation offered in any individual case of an analagous nature, during ordinary times, people would smile at the simplicity of its perpetrator.

Had Garfield suffered only a flesh wound, no one would have prayed for its supernatural cure—it would have been relegated to Nature and the doctors; but the terrible hopelessness and helplessness of the situation buried from sight the heartless conception of law that the aching heart might hope in the face of the inexorable and lovingly confide in the power of the supernatural to remove impending woe. Alas! with all his worth, Garfield was no more in the sight of Nature than the lowest man that breathes; and the sequel is instructive to those whose thoughts follow the line of law.

It is true there are many empiric means of cure, and it does not become us to say that prayer may not be one of them. As a fact, however, we might question whether this is established, save in cases where prayer acts as a direct cause through known mental laws. During the "women's crusade" on the saloons prayer effected to close a great many—but through the ears and sympathy of listeners. Among the Mormons I have seen many cases of restoration from sickness through prayer and anointing with oil. The virtue of the oil was questionable, the fervent faith of the patient being the chief working cause. It has been remarked that the morality among children is greater among the Mormons than elsewhere, and some claim this as the fruits of polygamy. Whatever influence this may exercise, I am persuaded the chief cause is owing to the fact that in Utah it is considered a lack of faith to send for a doctor. Having witnessed the restoration of adults through the "laying on of hands," they attribute the cure to the Elders' intercession with the Creator, and expect the same result to follow when they pray for children. But a child cannot exercise faith, the remedial element—hence, prayer, broken from the chain of causation, is unavailing, and thousands are sent to an untimely grave. Faith, within the radius of the nervous system *under certain conditions* is a working power, both curing and inducing disease, but outside of this radius it appears to be wholly inoperative. The means by which the mind effects molecular transformation in body tissue is unknown; but it could no more act without the nervous system than a man could communicate with an absent friend without mail facilities or telegraph wires, and the probabilities are that the modes are somewhat analagous. Prayer enters as a direct cause in filling spiritual needs. "Blessed are they that hunger and thirst after righteousness, for they shall be filled," is the expression of a natural law.

Physical science is slowly cultivating a habit of viewing Nature, subjective and objective, from the stand-point of law. Hence, in scientific circles, he who aims to teach is expected to conform to this method, let his opinions be what they may. The supernatural is being merged into the natural, itself expanding in the minds of men by the operation. Its infinite height and depth no man has fathomed. Habitual experiences of constancy engender habitual laws of thought.

Philosophy, which is a co-ordination of all science, has taught us the true sphere of science and the impotency of the human mind in dealing with subjects beyond this sphere. Science is limited to proximate causes Teleology here finds itself a trespasser. "First causes" are born of mental weakness, and are used but to cover a vacuity of thought. The mind cannot think beyond the conditioned, and any term borrowed from the conditioned applied to the absolute is a contradiction and contains the germs of its own destruction. The moment we predicate change, succession, time, thought, number, relation, will, etc. of the Infinite, that moment we make it less than this by reducing it to finite comprehension. Thus, a recent writer defending miracles says: "Prayer effects a change at the first link through God himself, and thus a corresponding change through the entire chain." A "first link," a last effect, intermediate motion, wrought in time and circumscribed in space! As a full complement to the thought we only need to add an anthropomorphic God, and the hypothesis is extremely simple. Given facts to support it, and we might allow that it had scientific worth; but we would never allow that it in any way approached the depth of an ultimate solution. Beyond this being circumscribed in time and space, we would be tempted to erect a greater.

Within late years philosophy has taken gigantic strides. The great discovery of the conservation and correlation of force has wrought a revolution in the thoughts of men. The persistence of force, and the indestructibility of matter is the fulcrum on which logic has placed its lever to raise man into something like a rational being. The energy of the universe is a fixed quantity. It may change in place, or change in mode, but in all changes it exacts equivalent for equivalent. Every event is the product and recompounding of the changing energy of preceding events. There is never a broken link in the chain, and never a *terminal* cause. How can we, as Scientists, claim causation for anything if we emancipate the entire realm of volition from its domination? The force of the will is a species of catalysis that liberates the stored energy of the system. A keg of dynamite in front of a loaded cannon, connected with a fuse, and this in contact with a piece of dry phosphorus, can be made to liberate an almost incalculable energy by simply a breath of warm air. Like this, the will is moved by feeble causes, and liberates energy apparently out of proportion to it cause, but is never uncaused. The direction of all changes is in the line of least resistance. Man has no will superior to this law. Spirit, spontaneity, and uncaused causes, are, in the light of modern science, mere fictions. It is a demonstrable scientific fact that every effort of thought or will has its mechanical equivalent. The thought we think, if not identical with, is at least dependent on the energy we derive from our food, and is measurable in these terms. Hence the will or thought of man has no power over Nature that Nature has not previously given. Or, as the poet says:

> Nature is made better by no mean
> But Nature makes that mean;—

Over that art which you say adds to Nature,
Is an art that Nature makes.

The philosophic mind can no longer conceive Nature as a machine running blindly at the behest of an outside power. Nor do we look upon the laws of Nature as enactments—a very common error. One has only to attempt to conceive the nullification of one of these hypothetic enactments, called "Natural Laws," to find what a hopeless chaos of thought the error leads to. Action and reaction are equal and opposite. The mind is incapable of conceiving this to be otherwise than it is. The creation or destruction of matter and force cannot be thought. There is no gradation between something and nothing. In fine, the laws of Nature are the laws of thought, and we can never transcend them. But above our mental impotence, in dealing with Nature as a machine capable of being otherwise constructed, we have the crowning flower of philosophy raised on the fertile fields of physiology, which discovers all the phenomenal world of matter and motion to be mere subjective states of our own consciousness. The natural itself is thus made greater than the wildest dreams of supernaturalism. It transcends all comprehension. We must allow external existence; but it is now a wholly "transfigured realism." This matter, which we in our ignorance have contemned, is shown to be "essentially mystical and transcendental." Science is pressing to the conclusion that all Nature has a subjective conscious side, and is no longer "blind." She contains the "promise and potency" of life. Faith may build from this a universal soul, who "lives through all life and extends through all extent;" and believe that the laws of Nature are to us symbols of the unwearying immutability which attaches to Infinite Perfection forever. Only imperfection reigns re-adjustment. We may further believe, that in this wonderful economy "all things work together for good;" and that the "clouds we so much dread, are big with mercy and will break with blessings on our heads." With less theology we may have a great deal more religion. We will never suspect that our prayers, which enter into, and are products of the forces around us, have to be borne to the confines of a *boundless* shore before they are reflected back in an answer.

KANSAS CITY, Jan. 9th, 1882.

HOW MATERIAL THINGS EXIST.

BY E. R. KNOWLES.

In the latter of two essays recently published by me in this magazine concerning the nature of the existence of matter, I commended, as in part, sound and correct, the philosophy of Bishop Berkeley. But Berkeley erred in maintaining that the *esse* of things is *percipi;* i. e., they can have no existence "out of the minds or thinking things which perceive them." He says, (*Treatise Concerning the Principles of Human Knowledge*, III.,) "That neither our thoughts,

nor passion, nor ideas formed by the imagination, exist without the mind, is what everybody will allow." To this I assent, but not to what follows: "And it seems no less evident that the various sensations or ideas imprinted on the sense, however blended or combined together (that is, whatever objects they compose), cannot exist otherwise than in a mind perceiving them. I think an intuitive knowledge can be obtained of this by any one that shall attend to what is meant by the term *exist*, when applied to sensible things. The table I write on, I say, exists, that is, I see and feel it; and if I were out of my study I should say it existed, meaning thereby, that if I was in my study I might perceive it, or, that some other spirit actually does perceive it. There was an odor, that is, it was smelled; there was a sound, that is to say, it was heard; a color or figure, and it was perceived by sight or touched. This is all that I can understand by these and the like expressions. For as to what is said of the absolute existence of unthinking things without any relation to their being perceived, that seems perfectly unintelligible. Their *esse* is *percipi*, nor is it possible they should have any existence out of the minds or thinking things which perceive them."

Though our perception of real ideas or material objects is the result of the action of the Divine Will on our minds, and the Eternal Spirit constantly sustains and presents these real ideas for the contemplation of created spirits, yet they have an existence out of the minds which perceive them. The table I write on exists, I see and feel it, and if I was out of my study, I should say it existed, but I mean thereby not only that "if I were in my study I might perceive it, or that some other spirit actually does peceive it," but that the table has an actual existence *there*, in that place, whether any one is there to perceive it or not.

Both space and time, "the prime elements of the cosmos," have a real existence independently of ethereal action, and in space and time all things exist; they (*i. e.*, space and time) are attributes of the Divine Being. We have a clear and necessary intuitive, knowledge of these because they are attributes of Him in whom we truly live, move, and have our being, and because they are necessary to our existence.

An ingenious gentleman suggests the use of burning oil for repelling hostile fleets, and for harbor defense. He says: "A hundred thousand barrels of oil poured upon an out-flowing tide would cover a large area of water, and when set on fire would sweep a fleet with a torrent of destruction that nothing could resist. When a stream of burning oil ran down the Alleghany River last winter, the flames sometimes leaped up nearly 100 feet, and threw out lateral tongues of fire terrible to see. Such flames around an iron-clad fleet would asphyxiate all on board.

GEOLOGY AND MINERALOGY.

THE CHALK BEDS OF WAKEENEY, KANSAS.

BY G. C. BROADHEAD.

It was rather a bleak autumn day on the bare prairie, with the wind howling, rain slowly dropping and slightly freezing. Nevertheless, as dark as the day looked, the white chalk beds attracted my attention. On the hill-top are found occasional outcroppings of a pebbly conglomerate and roughly bedded rock thirty to forty feet thick, which has been referred to the Pliocene Tertiary. In some places this contains moss-agate: underneath this we find twenty feet of white clay, often used instead of lime. Stone walls are laid up with it, and houses are also plastered with it, but it has only been successfully used in-doors.

Below this we find the chalk beds of the Niobrara group (cretaceous). At the quarries fragments of *Haploscapha* are found, indicating a very large-sized shell, sometimes measuring over two feet across.

The railroad depot and Keeny block, and some other buildings are constructed of this white stone. It is very soft, can be easily cut with any tool, and some beds are easily frost-cracked. When first quarried the rock has a delicate dove-color with occasional dark specks which are probably organic. But it is soon bleached.

At the "Whiting" quarry of Mr. George Pinkham may be observed a one-inch band of brown ochre. Mr. Pinkham grinds this in a puddling mill with two wheels, in a vat eight feet in diameter by three feet high. On the hill-side is a spring of never-failing water from which the water is conveyed to the vat, then passes into a settling vat and further on into another, carrying the ground chalk with it. This is dipped out, dried and sent to market, and is chiefly used at a glucose factory at Leavenworth City. The whiting is worth fifty to sixty cents per one hundred pounds at Wakeeney.

At Leavenworth it will retail at three cents per pound. It is also used in kalsomining. The business of this amounted to about ninety tons during 1881. This is said to be the only whiting mill in this country. There are many other places in western Kansas where it could be made, for the supply is practically inexhaustible.

PLEASANT HILL, Mo., December, 1881.

THE GENESIS AND DISTRIBUTION OF GOLD.

BY PROF. J. S. NEWBERRY.

Most of the quartz veins which carry gold belong to the class of what are called segregated veins. These occur only in metamorphic rocks, are lenticular sheets, limited in depth and lateral extension, and generally showing little of the banded structure so characteristic of fissure veins. They consist mainly of quartz, in which the gold is sometimes free, but more commonly contained in iron pyrites, with which yellow copper is often associated. Sometimes the gold is not strictly confined to the quartz veins, but extends more or less into the inclosing rocks, which are oftener than otherwise magnesian slates.

The gold in segregated veins would seem to be indigenous to the formation in which it occurs, and not, as in fissure-veins, to have been derived from some foreign source. It is usually supposed that, before they were metamorphosed, the rocks which inclose the segregated veins contained gold generally, though sparsely, disseminated through them, and that, in the process of the segregation of the siliceous matter to form sheets of quartz, the gold was somehow gathered and concentrated by it.

Sir Roderick Murchison, guided by his study of the gold deposits of the Ural Mountains, supposed that auriferous quartz veins were confined to Paleozoic rocks, but that the gold impregnation had taken place at a comparatively recent date. It was demonstrated, however, by Professor Whitney, in the prosecution of the geological survey of California, that the metamorphic slates which carry gold in the Sierra Nevada are of Triassic and Jurassic age; and in the light of later observations, we may say that metamorphic rocks of all ages contain auriferous veins. Nearly all the great mountain chains of the world contain more or less of such veins, and as these mountain chains have been the great condensers of moisture, and erosion has been constantly wearing down their slopes, placer deposits have been formed which have supplied most of the gold yielded by the earth to man. As it can be procured from them by the simplest methods, the work of its extraction was begun by prehistoric races, and the Altai, the Himalayas, the Ural Mountains, the Australian Alps, the Sierra Nevada, and the Rocky Mountains, have in turn contributed their millions to the treasuries of the world. These mountain chains are of very different ages, and we have abundant evidence that gold has existed in some of them from the earliest geological times. The oldest mountains of which we have any knowledge—the Laurentian, of Canada, now nearly removed by erosion—contained auriferous quartz veins that have supplied gold to all the successive formations which have been derived from their ruins. The gold impregnation of the Laurentian rocks dates back certainly to the period of their metamorphism; and this was pre-Silurian, for the undisturbed lower Silurian strata overlap and partially cover these gold-bearing rocks.

In the same way, the gold at the Black Hills is proved to be pre-Silurian, since the Potsdam sandstone which abuts against the Archean nucleus of the hills in places contains rolled fragments of the Archean rocks, and gold washed from them in such abundance as to form rich mining ground—the so-called cement deposits of that region. The distribution of gold from the Archean rocks has probably been constantly going on from the Silurian age to the present day. This is shown in the almost universal dissemination of gold through the drift of New England, New York, Ohio, etc., where the superficial materials have been largely derived from the Canadian highlands. In Ohio, gold is found in the drift clays, sands, and gravels, and locally in as great quantity as in the poorer placers of California. There is little doubt that the mechanical sediments derived from the wear of the Archean rocks all contain gold, and since it has been proved that gold exists in sea-water, it has probable impregnated all the organic marine sedimentary rocks as well. In the subsequent metamorphism of some of these strata it has been concentrated in such a way as to produce auriferous quartz veins rich enough to be worked.

From these facts it will be seen that there is no geological age which can be called the age of gold. It existed in the oldest rocks known, and from them and their derivatives, more modern rocks, it has been, and is now, being constantly distributed by both mechanical and chemical processes. Even some of the igneous rocks of the western country are said to contain minute quantities of gold;* and this is not surprising, if, as is supposed, much of our volcanic material is a fused condition of sedimentary rocks.

GOLD IN FISSURE-VEINS.

As is well known, gold is a frequent constituent of the fissure-veins of the Far West. The ore of the Comstock vein has yielded about forty-seven per cent of gold and fifty-three per cent of silver; and it is probable that one half of the so-called silver veins contain gold in sufficient quantity to be of practical value. In some true fissure-veins, gold is the only valuable ingredient, but more generally it is associated with several other metals. The Revenue Mine, at Tuscarora, Nev., contains silver in the form of arsenical and antimonial sulphide, and gold in iron pyrites frequently crystalized lining cavities. At Eureka, the ore occurs in chambers, which were originally filled from a solution issuing through fissures from below and deposited as argentiferous galena and auriferous pyrites, the silver and gold being in nearly equal proportions. In the great veins of Bingham Cañon, and at the Cave Mine, near Frisco in Utah, the combination is the same, and, as at Eureka, the sulphides have been decomposed to a spongy, rusty gossan. At the Bassick Mine, in Colorado, gold exists free, or in combination with tellurium and associated with zinc, copper and iron. In all these, and many other cases which might be cited, the gold has been brought up in a hot solution impregnated with mineral matter far below, and deposited as the tem-

* For example the basalt of the Snake River lava plain and according to Prof. J. J. Stevenson, the trachyte of Colorado.

perature and pressure were reduced. The formation of this class of auriferous deposit is well illustrated by the Steamboat Spring, in western Nevada, where hot water, flowing out through fissures produced by subterranean forces, is depositing a siliceous vein-stone, containing sulphides of iron, copper, oxide of manganese, and metallic gold. There is little doubt that, in the great mineral belt lying between the Sierra Nevada and the Rocky Mountains, where, in Tertiary times, volcanic activity was exhibited on a grand scale—sedimentary rocks upheaved and fissured in every direction, with great outflows of fused material—hot springs, like the Steamboat, were everywhere busy, doing similar work. Bursting out at different places and times, and flowing from different sources, the solutions they carried and the ores they deposited varied greatly; but the methods of accumulation, transportation, and deposition were essentially the same, namely, the leaching of various rocks by steam and hot water under great pressure, by which silica and sparsely-disseminated metals were gathered and driven toward the surface, to be deposited as the pressure and temperature were reduced. Gold collected in this manner was unquestionably taken into chemical solution, and in the resulting vein deposits we find it in strings, scales, and irregular masses, often beautifully crystallized and associated with other crystallized minerals which are certainly chemical precipitates.

We may sum up the teachings of geology in regard to the genesis and destribution of gold by saying:

First. Gold exists in the oldest known rocks, and has been thence distributed through all strata derived from them.

Second. In the metamorphosis of these derived rocks it has been concentrated into segregated quartz veins by some process not yet understood.

Third. It is a constituent of fissure-veins of all geological ages, where it has been deposited from hot chemical solutions which have leached deeply-buried rocks of various kinds, gathering from them gold with other metallic minerals.

Fourth. By the erosion of strata containing auriferous veins, segregated or fissure, gold has been accumulated by mechanical agents in placer deposits, economically the most important of all the sources of gold.—*Engineering and Mining Journal.*

MINING PRODUCT OF COLORADO FOR 1881.

Boulder	$ 535,482 38
Chaffee	100,000 00
Clear Creek	2,204,980 34
Custer	608,549 37
Dolores	125,000 00
Fremont	14,535 50
Gilpin	2,150,700 00
Grand	10,000 00

Gunnison	535,033 00
Hinsdale	187,375 00
Lake	13,502,029 00
La Plata and San Juan	40,000 00
Ouray	78,000 00
Park	350,000 00
Pitkin	120,000 00
Rio Grande	221,000 00
Saguache	40,000 00
Summit	1,828,000 00
Grand total	$22,680,685 09

In presenting this table of returns for 1881, it is but justice to say that while extraordinary efforts have been made to secure accurate figures, it is not claimed that they are in all cases absolutely reliable. Knowing the anxiety of the public to be advised concerning the yield of the mines for the past year, we give them as received, but it is probable that a revised table will be prepared and published. From the manner in which the returns have been received, no attempt has been made to separate the metals. Therefore it will be understood that the totals comprise gold, silver, copper and lead.

PRODUCT FROM 1859 TO 1882.

YEAR.	GOLD.	SILVER.	COPPER.	LEAD.	TOTAL.
1859 to 1870. .	$27,213,081 00	$ 330,000 00	$ 40,000 00	$	$ 27,583,081 00
1870	2,000,000 00	650,000 00	20,000 00	. . . . .	2,670,000 00
1871	2,000,000 00	1,029,046 00	30,000 00	. . . . .	3,059,046 00
1872	1,725,000 00	2,015 000 00	45,000 00	5,000 00	3,790,000 00
1873	1,750,000 00	2,185,000 00	65,000 00	28,000 00	4,028,000 00
1874	2,002,487 00	3,096,023 00	90,197 00	73,676 00	5,262,383 00
1875	2,161,475 02	3,122,912 00	90,000 00	60,000 00	5,434,387 02
1876	2,726,315 82	3,315,592 00	70,000 00	80,000 00	6,191,907 82
1877	3,148,707 56	3,726,379 33	93,796 64	247,400 00	7,216,283 53
1878	3,490,384 36	6,341,807 81	89,000 00	636,924 73	10,558,116 90
1879	3,193,500 00	15,385,000 00	*	532,362 00	19,110,862 00
1880	3,206,500 00	18,615,000 00	*	678,800 00	23,000,000 00
1881	. . . . .	. . . . .	. . . . .	. . . . .	22,680,685 09
Total	$54,617,450 76	$59,811,760 14	$632,993 63	$3,341,362 72	$140,584,752 36

* No Record of Copper.

—*Denver Tribune.*

PROCEEDINGS OF SOCIETIES.

THE ST. LOUIS ACADEMY OF SCIENCE.

The twenty-fifth annual meeting of the St. Louis Academy of Science was held in their rooms in Washington University, January 3rd. President Dr. George Engelman in the chair. In his address the President congratulated the members upon the continued success of their organization and upon their meeting again, for the first time in twelve years, in their own hall, surrounded by their own library and the germ of a museum. The Society first met in rooms in the Medical College, on Seventh and Myrtle streets. This was the place of meeting until the fire of 1869, in which a part of the college building and the museum which the Academy had collected were destroyed. By courtesy of the Board of Public Schools, rooms in the Polytechnic building were next occupied by the Society. These, however, failed to supply the wants of the Academy, and an offer of rooms from the Board of Trustees of Washington University was accepted. These rooms have been occupied ever since by the society, which meets the first and third Mondays in each month. The expense of fitting up the hall was liquidated mainly by funds subscribed especially for that purpose. The Corresponding Secretary reported an increase in the number of exchanges, so that they now amount to two hundred and sixty in foreign countries and one hundred and twenty-seven in the home list, ten of which are in the British provinces, making in all three hundred and eighty seven, an increase of fifteen over last year. Seven new corresponding members were added during the year. There were nine associate members lost to the organization by death, removal and resignation. Three members were dropped for non-payment of dues. During the year nine new members were received. The membership now numbers ninety-nine. Material for a new number of Transactions is now in the hands of the printer. So far the Treasurer, Dr. Enno Sander, has met all demands which were made upon him. He submitted the following as his report for the year: Expenses, $835; collections, $738. Balance due treasurer, $97.

The Corresponding Secretary, Judge N. Holmes, reported that the foreign exchanges were effected principally through the Smithsonian Institution, but that a few were obtained through private sources. He had received for sale and exchange eighty-one numbers of Transactions of the Academy and twenty copies of Part I of the Archæology of Missouri. He had disposed of twenty-four numbers of the Transactions and four copies of the Archæology, and exchanged fifty-six Transactions and fifteen archæological numbers, and had on hand two copies of the Transaction and one volume of archæological reports. The account showed

the total receipts and disbursements to be as follows: Receipts, $72.75; disbursements, $58.67; balance on hand, $14.08.

The President in speaking of the weather for the past year stated that the temperature had been exceedingly high, on certain days reaching 107°. The Doctor said that the reports from the Signal Service were not to be relied upon, for, although the instruments used were good, the exposure was faulty; the thermometer on sunny days going higher than it should, because of the reflection of heat from the roof over which the thermometer was placed at about the height of five feet. There were no heavy rains from the middle of June to the middle of September, but the average rain-fall was not noticeably small. The drought occurred at a time particularly unfavorable to the corn crop, and the statement of the average rain-fall during a year furnished no criterion of the crops harvested. He further stated that in all probability the balance of the present winter would be mild.

The following gentlemen were elected officers for the ensuing year: President, Dr. George Engelman; First Vice-President, Dr. Leet; Second Vice-President, M. L. Gray; Corresponding Secretary, Judge Nathaniel Holmes; Recording Secretary, Prof. Nipher; Treasurer, Dr. E. Sander; Librarian, Dr. S. Hambach; Curators, Dr. Hambach, Dr. Evers and Mr. A. Leonhardt.

Dr. Hambach was elected a life member of the Academy in consequence of his past services.

Henry Blattner was proposed by Prof. Nipher for membership. Action was deferred until next meeting.

There was received a donation from Dr. H. H. Mudd, consisting of a collection of snakes, centipedes and lizards caught in Southern Illinois.

At the Washington University, January 16th, the Academy of Science held one of its regular meetings, Dr. Engelman presiding.

The corresponding secretary was authorized to send for the Geological Report of Colorado. A communication was also received from the Paris Zoölogical Society, asking for suggestions on the subject of the nomenclature of organic beings, upon which there is no united systems at present. Prof. Potter, Professor of Geology, exhibited some very fine specimens of silver ore from the mines of Königsberg, silver from Lake Superior, and copper from the same lake. The copper was particularly excellent, being almost in a virgin state. The Professor also spoke of the various places in which native lead had been found. Dr. Engelman spoke some time on the Hot Springs of Colorado. He had there, last summer, examined four hot springs. The best and longest known were those of Idaho, and Clear Springs, which are the most insignificant. Their temperature is about 100°, and the prevalent ingredient, as in all the springs of Colorado, hot or cold, is carbonate of soda. Some contain iron, others sulphur, others common salt, and some a slight admixture of purgative salts, such as sulphate of

magnesia and sulphate of soda, but those which possess purgative qualities are few, and their qualities are insignificant.

At Cañon City, where the Arkansas River breaks through the famous gorge, is another spring. He would remark that those springs generally appear where the granite rocks connect with the secondary rocks of a recent date. At Cañon City the secondary rocks are lying on the same slope with the granite ones, and the same is true of Las Vegas, New Mexico and the Middle Park Springs, where the Grant River breaks through. The temperature at Cañon City is about 100°; there are here very good bathing establishments and the scenery is very beautiful.

The springs of Middle Park were to him most interesting. They are hot sulphur ones, about 112° in temperature. A good many small ones gather in a place not larger than one-fourth of the room in which they were assembled. They fall into a basin eight to ten feet high, and there is a considerable little cascade. It is roofed in with a rough sort of building and used as a mineral bath. When one first gets in he is inclined to draw his feet out, but after a while he will get under the waterfall and enjoy a fine douche. The springs are very medicinal, containing salts of soda and a small quantity of sulphur, enough to impregnate the neighborhood with an odor of hydrosulphuric acid. They are out of the way, between forty and fifty miles from the railway, reached by a tri-weekly stage communicating with the railway at Georgetown. The accommodations are not very good, but he was convinced that there was a great future for that spring from a medicinal point of view.

The next which he had visited was the Las Vegas Spring. This is situated some six miles from Las Vegas, through which town the new Atchison, Topeka & Santa Fe Railroad runs. There are good hotels and bath-houses, and the climate is such that it is expected winter guests may be invited. The waters are from 120° to 125° in temperature, too hot for use, and have to be cooled off. But the bath-houses have every accommodation—sweat baths, steam baths, etc.

A general discussion on the subject of springs was indulged in, and the grave scientists unbended themselves in jocose reflections upon the alleged healing properties of Missouri Springs, especially. Professor Potter said that chemical analysis of the Eureka Springs showed that they contained the usual ingredients of seidlitz waters, with about a fourth of a grain of mineral matter to a gallon of water, and the properties of the rest were equal to about one-fifth of those of Mississippi water.

CORAL LIFE AND GROWTH.

The Mechanics' Institute's usual winter course of free, popular lectures was begun last evening. The lecturer was Prof. Joseph LeConte, of the State University, who gave the first of a series of three lectures, in which he will expound the mysteries and beauties of coral life and growth. He spoke for an hour and a half last evening, greatly to the entertainment of his audience, illustrating his

subject with numerous drawings, which materially aided comprehension. He said that he had selected the subject because of its great popular and scientific interest, and because he had personally investigated it, having spent a whole winter in Florida and the adjacent keys for that purpose. The matter was of great interest because of the strange forms and gorgeous coloring of the animals by which these reefs were made; on account of the gem-like beauty of the islands formed by their agency; on account of the large quantity of land which had been added to the habitable globe, wholly through the influence of the coral animals, now inhabited by hundreds and thousands of people, and which would not exist but for these creatures; because of the fact that the largest body of land which has been added to the habitable globe had been in the territory of the United States—the peninsula and keys of Florida, and, finally, on account of the dangers to navigation arising from coral reefs.

THE FLORIDA REEFS.

Coral reefs are peculiarly dangerous to navigation because of their rising abruptly, so that though the sounding line may show 6,000 feet of water within half a mile, the reef may rear its perpendicular wall for the ship's destruction. The most dangerous point for navigation upon the face of the earth is the reefs of Florida. There are more wrecks upon that coast than in any other portion of the world. The largest town in Florida, Key West, is built upon a coral reef, on account of the frequency of wrecks upon the coast. If it were not for the wrecking business the town would not exist. With the exception of cocoa-nuts there is absolutely nothing raised upon the reef. The wreckers came first to prey upon the wrecks, then came merchants to prey upon the wreckers, next lawyers and doctors to prey upon both classes, and finally the clergymen to pray for all. [Laughter.] The subject of corals was, also, the Professor said, of scientific interest, because in these coral reefs we had the proofs of the vast oscillations and variations in the earth's crust, on a scale of which we have no other evidences at all.

A very wide spread misunderstanding exists as to the manner in which reefs are formed, one which has entered into the public mind, and of which it is almost impossible to dispossess the public mind. The idea is that these animals are little insects; that they build like ants and bees do, and when they are alarmed they disappear into their little burrows, and these reefs are accumulations of millions of these little insects in generation after generation. I shall show that there is not the semblance of truth in this idea.

The Professor then explained that the coral animal is a polyp belonging to the group of radiata; that it consists of limestone deposits in the shape of a hollow cylinder with top and bottom disks, surmounted with tentacles, containing a stomach and enveloped with gelatinous organic matter. The tentacles or arms are provided each with a mouth for the absorption of food. The coral is coralline limestone after the gelatinous organic envelope is decayed and removed. The animals which build reefs are not much larger than pin-heads. The development

and growth of the coral tree and head coral was clearly explained, showing it to be analagous to the same process in vegetation. It was further explained that coral formed and threw off eggs, which floated to some suitable place, and there began the process of development independently, forming new colonies, which in time connect and form reefs, upon which are deposited accretions, in time building up keys and islands.

Reef-building corals will not grow at a depth of over one hundred to one hundred and twenty feet. There have been reef-building corals found at a depth of 1,000 feet, but they were dead—drowned by being carried below their depth. This confines them to coast lines and submarine banks. Coral will not grow where the temperature is lower than 68° at any time, that is of the ocean, not the air. Therefore, they are confined to the tropical regions. They will not grow except in clear salt water; hence there is always a break in reefs opposite the mouth of a river. Finally, they demand free exposure to the beating of the waves. The more violently the waves beat the more rapidly the corals grow, because the agitation gives them ventilation. Corals will grow in the face of waves whose beatings would gradually wear away a wall of granite. The four kinds of coral reefs found in the Pacific Ocean are fringe reefs, barrier reefs, circular reefs, inclosing lagoons in the ocean, and small lagoonless coral islands. The explanation of the formation of the last three named will form the subject of the next lecture.—*San Francisco Chronicle.*

CANADIAN ACADEMY OF ART.

A meeting was held at Montreal, Canada, to create a Canadian Academy of Art, Dr. J. W. Dawson, C. M. G. (Chairman), and Dr. T. Sterry Hunt, Montreal; Dr. Daniel Wilson, President of the University of Toronto; Dr. Selwyn, of the Geological Survey; Dr. Lawson, of Dalhousie College, Halifax; Mr. J. M. Lemoine, President of the Literary and Historical Society of Quebec, and Mr. Fauchar de St. Maurice, M. P., were present at the meeting. The proposed Academy is to be composed of six sections representing English letters, French letters, history and archæology, mathematical and physical sciences, geological sciences and biological sciences. It is probable that the membership will be limited to ten or twelve in each section.

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HISTORY.

WHO DESTROYED THE ALEXANDRIAN LIBRARY?

BY WM. EMMETTE COLEMAN.

The famed Alexandrian Library, said to have contained several hundred thousand volumes, was originally contained in the Alexandrian Museum, situated in the Bruchion, the aristocratic quarter of the city. In the course of time an additional library was established in the adjacent quarter, Rhacotis, and placed in the Serapion, or Temple of Serapis. This library was called the Daughter of the one in the Museum, and is said to have eventually been composed of 300,000 volumes, while the Bruchion Library contained 400,000. In my judgment these figures are exaggerations. When the fleet was set on fire, by order of Julius Cæsar, during the siege of Alexandria, B. C. 47, the wind carried the flames to the locality of the Bruchion and destroyed the library; 400,000 volumes perishing, according to the statement of Orosius (quoted by Bonamy, *Dissertation historique sur la Bibliothique d' Alexandrie, in Histoire de l' Academie des Inscriptions et Belles Lettres*, Vol. IX 17 '36). The Serapion, however, escaped, and was further enriched not long after by the present of 200,000 volumes to Cleopatra by Mark Antony.

In A. D. 390, Theophilus was the Christian Bishop of Alexandria. A disturbance arose between the pagans and Christians of that city. The Serapion was the headquarters of the pagans. Theophilus, who is described as "a bold, bad man, whose hands were alternately polluted with gold and with blood," obtained a rescript from the Emperor Theodosius, enjoining the destruction of the Serapion. Theophilus drove out the *Savans* who assembled in the Serapion, dispersed the library, overthrew the temple, and built a church on its ruins. A few years after this Paulus Orosius, a Spanish disciple of St. Jerome, tells us that on his return from Palestine, he saw at Alexandria the empty book-cases which had been in the Serapion previous to its pillage by Theodosius. (Bk. vi, ch. 15.) It is clear, then, that at the beginning of the fourth century, the celebrated Alexandrian Libraries had both ceased to exist: nevertheless many believe that the great Library of the Ptolemies was burned by the Arabs in the seventh century.

The principal foundation for this story is a passage in the writings of Abulfaraj (Latin, Abulfaragius), an Armenian Christian author of the thirteenth century. He is also called Gregorius Bar Hebræus, that is, Gregory the son of a Hebrew, for he was a Jew by birth. In 1264 he was elected primate (a position next to patriarch) of the eastern Christians. He wrote a *Chronicle* in Syriac, of universal history from Adam to his own time. He abridged this work in Arabic,

under the name of *History of the Dynasties*, an edition of which in Arabic and Latin was published at Oxford in 1663, edited by Pococke, in two quarto volumes. It is in this abridgment we find the mention of the burning of the Alexandrian Library by the Arabs. Amru, the Arabian conqueror, after a siege of fourteen months, succeeded in capturing Alexandria, A. D. 640. Omar was then the Mohammedan Khalif (or Caliph), Amru being his principal general. The following is a literal translation of the passage in Abulfaragius relative to the destruction of the Library: "John the Grammarian came to Amru, who was in possession of Alexandria, and begged that he might be allowed to appropriate a part of the booty. 'Which part do you wish for?' asked Amru. John replied, 'The books of philosophy which are in the treasury (library) of kings.' Amru answered that he could not dispose of these without the permission of the Emir Al-Moumenin Omar. He wrote to the Emir, who replied in these terms, 'As to the books you speak of, if their contents are in conformity with the Book of God [the Quran] we have no need of them; if, on the contrary, their contents are opposed to it, it is still less desirable to preserve them, so I desire that they may be destroyed.' Amru-Ben-Alas, in consequence ordered them to be distributed in the various baths in Alexandria, to be burned in the stoves, and after six months not a vestige of them remained." (See *History of the Dynasties*, Book ix, page 114, Oxford, 1663.)

There are various excellent reasons for doubting the truth of this story. First, the silence of earlier writers. Eutychius, patriarch of Alexandria in the tenth century, in his *Annales of Alexandria*, tom. ii, pp. 316–319, has given a detailed narrative of the capture of Alexandria by Amru, but not a word about the burning of the library. Eutychius, who lived in Alexandria two hundred years after its capture, never heard of the burning, while Abulfaragius, who lived in Asia, six hundred years after, can give full details, even the very words of the Khalif Omar! Elmacin, who wrote a *History of the Saracens* early in the twelfth century, and a Christian writer, also narrates the capture of Alexandria, but says nothing of the destruction of the library. (*Historia Saracenica Georgii Elmacini*, 4to, 1625, page 28). Murtadi, of Cairo, wrote in Arabic, in the thirteenth century, a work on the "Wonders, etc. of Egypt," (French translation, Paris, 1666,) in which an account of the conquest of Egypt by Amru with Omar is given, including the correspondence of Amru with Omar, but no mention is made of the library-burning story. The best of all the Arabian chroniclers was Abulfeda of the fourteenth century, who in his *Annales Moslemici ad Annæ Hegiræ CCCVI*, published at Leipsic in 1754, gives full details of Omar's conquests, but omits all reference to the library-burning; neither does he refer to it in his valuable work on the *Geography* of Egypt. A few Mohammedan writers have repeated Abulfaragius' story, as Mahirzi, Ibn Chalcdun, Hadschi Chalfa, etc., but their testimony, being borrowed from Abulfaragius' work, has no weight. There seems, however, to have been one Arabian writer who referred to this event before Abulfaragius, and that is Abd-Ul-Latif (Abdollatiph), who wrote a valuable work on the history, antiquities, and geography of Egypt a short time before

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Abulfaragius was born (*Compendium memorabilium Ægypti*, Tubingen, 1789). It is probable Abulfaragius was indebted to Abdollatiph for his first information concerning this story. Neither gives any authority for his statements. So much for the external evidence.

The internal evidence is strong against the story. John, the Grammarian, who is said to have requested the books from Amru, was the last disciple of the Neo-Platonic Ammonius Saccas, and was surnamed *Philoponus* (lover of labor) on account of his laborious studies of grammar and philosophy. Some of his treatises are still extant, one being in Fabricius' *Bibliotheca Græca*, ix, pp. 458–468 (See Gibbon's Decline and Fall, Vol. 5, p. 228). Now, John *was dead* before Alexandria was captured, December 21–22, 640. (See Delepierre's *Historical Difficulties*, London, 1868, page 36). The foundation of the story, John's request, is therefore false.

Second. In a letter from Amru to Omar (Etuychius *Annales* ii, 319), Alexandria is described as containing 4000 baths. The volumes were doubtless mostly parchment (what an absurd idea to heat baths with parchment!), and to keep 4000 baths heated six months, what an enormous quantity of MSS would be required. The Alexandrian baths were constructed on the *Hypocaust* principle, we are told, that is, the fires were kept burning in a vaulted chamber below, from which by tubes the upper rooms were heated; and to keep one such heated would require over one hundred MSS per day; more likely several hundred. But taking one hundred per day for 4000 baths, in one day 400,000 volumes would be consumed, and in six months nearly seventy-five millions would be required Supposing the library contained 700,000 volumes, then for 4000 baths to consume them in six months would be an average of *less than one* MS a day for each bath. This part of the story is a palpable falsehood.

Third. The destruction of the religious books of the Jews and Christians was opposed to the orthodox precepts of the Mohammedans. The Khalifs forbade, under heavy penalties, the destruction of all such works, and we have no record of any such acts of vandalism in the early conquests of the Saracens, and it was decreed that the works of profane science, historians or poets, physicians or philosophers, might be lawfully applied to the use of the faithful. See Reland, *de Jure Militari Mohammedanorum*, in his third volume of *Dissertation*, p. 37; quoted in *Gibbon*, v. 230.)

None of the Greek writers, who were bitterly hostile to the Saracens, allude to their burning of the Library. Even Abulfaragius in the original Syriac version of his *Chronicle* did not refer to the burning; it was only when he came to prepare his abridgment in Arabic, in his old age, that he added this narrative.

Among the first to dispute the truth of Abulfaragius' story was Reinaudot, in his *Histoire des Patriarches d' Alexandrie*, page 170. Succeeding him, Gibbon advanced cogent reasons for a rational skepticism as to its truth. (*Decline and Fall*, chapter 51, Vol. 5, pp. 228–231, Harper's Ed). Since Gibbon, Reinhard (in a special dissertation published at Göttingen in 1792), Assemanni, and many others have declared against its truth. Octave Delepierre, Secretary of Legation

to the King of the Belgians, in his valuable *Historical Difficulties and Contested Events*, London, 1868, has discussed the question and decided against its truth. An excellent summary of the evidence against its truth, based principally on Gibbon, is found in the London *Human Nature*, Vol. 1, pp. 546–7. On the other side, among the advocates for the truth of the Saracenic burning are found De Sacy, Langles, Von Hammer, M. St. Martin, Prof. White, and lastly M. Matter. In the *Histoire de l' Ecole d' Alexandrie*, by M. Matter, Paris, 1840, is contained all the authorities for and against the burning of the Library by the Arabs.

The *Encyclopædia Britannica* (8th edition, Vol. 2, p. 733,) speaks of the burning of the Library as an act of barbarism "repugnant to the character of Omar and his general," and continues; "It is highly probable that few of the 700,000 volumes collected by the Ptolemies remained at the time of the Arab conquest, when we consider the various calamities of Alexandria from the time of Cæsar to those of Caracalla, Diocletian and the disgraceful pillage of the Library in A. D. 389, under the rule of a Christian Bishop, Theophilus, a far less respectable character than the Arabian conquerers."

Very few scholars of to-day credit the story of the Saracenic destruction of the Library, the "consensus of the competent" being that it is simply an Oriental fiction of the Middle Ages; and such is the opinion of the present writer.

PRESIDIO of San Francisco, California.

MISSOURI HISTORICAL NOTES.

COMPILED BY G. C. BROADHEAD.

1762—The country west of the Mississippi River ceded to Spain by France, but not made public until 1764.

1800, Oct. 1—Louisiana, including all territory west of the Mississippi River, ceded by Spain to France under the treaty of St. Ildefonzo.

1804—Louisiana purchased from France by the United States and divided into two territories, Orleans and Louisiana—the latter included Arkansas, Missouri and all the territory west. Capt. Amos Stoddard was temporary governor.

Don Charles Dehault Delassus was the last Spanish governor. The country for a short time was attached to the government of the territory of Indiana. Gen. W. H. Harrison, Governor; capital, Vincennes.

1805—Territory of Louisiana organized; Gen. James Wilkinson, Governor; Frederick Bates, Secretary. The territory was divided into five districts, afterward called counties, and named respectively St. Louis, St. Charles, St. Genevieve, Cape Girardeau and New Madrid, the latter including Little Prairie and Arkansas. These counties extended indefinitely westward, St. Louis being bounded on the north by the Missouri River and St. Charles, including all north of the river to the Rocky Mountains.

1807—Meriwether Lewis Governor of Upper Louisiana.

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1808—District of Arkansas organized.

1809—Death of Lewis; Frederick Bates Secretary and acting Governor.

1810—Benjamin Howard, Governor of Upper Louisiana.

1812—Frederick Bates Secretary and acting Governor.

1812, Dec. 7—Territory of Missouri organized, including the districts or counties of St. Charles, St. Louis, St. Genevieve, Cape Girardeau, New Madrid and Arkansas, the latter still attached to New Madrid county.

1808 Nov. 10—Grand council with Indians at Ft. Clarke (Ft. Osage, afterward called Sibley) by which the Osages relinquished title to all territory east of a south line from Ft. Clarke to the Arkansas River.

1813—First territorial legislature, Wm. Clarke, Governor.

1818—County of Washington organized.

1814—County of Lawrence (in Arkansas) organized, from western part of New Madrid.

1816—County of Howard organized, including all west of a line due north of the mouth of Osage River; also all that portion between the Osage and Missouri.

1818—County of Cooper organized, including all of Howard south of Missouri River.

1815—Gabriel Rupe settled near Lexington.

1818—Counties of Jefferson, Franklin, Wayne, Lincoln, Madison, Pike and Cooper organized.

1819—Territory of Arkansas organized.

1815—Indiana relinquished title to territory north of Missouri Rivery.

1820—Lillard county organized from Cooper, with Mt. Vernon as county seat. This place is about where Berlin on the Missouri River is.

1821, March 2—Missouri admitted into the Union.

1820—Jackson County taken off Lillard, and included what is now Cass and Bates.

1834—Name of Lillard changed to Layfayette.

1834—Johnson County taken off Lafayette.

1835—Van Buren County taken off Jackson, included the present county of Cass and as far south as line between townships 39 and 40.

1849—Name of Van Buren County changed to Cass.

1833—Bates County was established, but not organized until 1841.

1854—Bates County reduced to its present limits. The line of Cass and Bates is now Grand River and on line between townships 42 and 43.

1837—That portion known as Platte Purchase added to Missouri, included all west of a line due north of mouth of Kansas River.

Signor C. Desimoni, of Genoa, has just published a monograph upon John Cabot (father of Sebastian Cabot), the discoverer of Labrador and Cape Breton Island prior to Columbus. He examines carefully all the authorities relating to

the subject, and prints for the first time in one collection all the known official documents, notices in accounts, passages in contemporary chronicles, or correspondence in any way bearing upon John Cabot and his discoveries. Some of these, drawn from Spanish and English sources, are new. The author adduces the conclusions of Mr. Henry Harris, an American in Paris, who is at work upon a new publication on Columbus, to support his own that the Continent of America was discovered by Cabot in 1497, at least a year before Columbus found *terra firma*.

ASTRONOMY.

SOME PHYSICAL CHANGES ON THE SURFACE OF JUPITER.

BY PROF. C. W. PRITCHETT, MORRISON OBSERVATORY.

The changes which have taken place, within the last three years, on the apparent surface of the planet Jupiter, are really wonderful. To one who has seen the giant planet but a few times in his life, and even to an astronomer, who has not noted from week to week the markings on his surface, a detailed account of their changes would be almost incredible. Perhaps the phenomenon of the great red spot, which became so conspicuous in July, 1878, and which still persistently holds its place, has awakened an unusual interest in the study of his surface, but certain it is, that never before, has his disc been so closely watched, and never have so many phenomena been noted, in so short a time, as within the last three and a half years.

In this note my object is not to describe these changes, but specially to mention an instance observed here on the night of December 23rd. It chanced to be one of the finest nights of the whole year. The surface of the great planet was rarely ever seen under better conditions of altitude and atmosphere. Every line and marking came out with a distinctness which was a wonder even to an experienced observer. The great red spot, by the Jovian rotation, was approaching the central meridian of the disc; and I had begun my usual observation of the transit of the preceding end, when my attention was called to a condensed white nucleus situated in the north margin of the most southern of the equatorial belts. The threads of the Filar Micrometer, had been adjusted to the rotation axis of the planet, by the ephemeris of Mr. A. Marth. (Month. Not. R. A. S., Vol. 41, No. 7). One fixed thread was placed on one extremity of major axis of spot, and the movable thread was placed on the other extremity of that axis, and these threads were kept to this position by the driving clock, and an adjusting screw. At 7h. 7m. of local mean time the following end of red spot and the bright nucleus were on the same thread, or the bright spot was on the same

Jovian meridian directly north of the following end of red spot. As it requires more than one hour for the Jovian rotation to carry the major axis of spot across the central meridian, and all changes of relative position must take place between my micrometer threads, I had a very rare opportunity to compare changes, however slight. Not twenty minutes had passed till I could see, independently of the threads, that the white spot had a rapid motion relatively to the red spot. It was so marked and proceeded so uniformly with the time that I resolved to measure it minutely. My observation of the transit closed at 8h. 10m. and then I estimated by the eye that the bright nucleus had gained on the following end of the red spot, in one hour, three-eighths of the interval between my threads. The mean of a number of careful measures proved it to be three hundred and sixty-one one-thousandths of the interval, or 4.33″ of the Jovian disc.

Now the question comes up, was this a motion of translation? If so, we shall have to believe that a motion can take place in the Jovian atmosphere at the rate of nearly seven thousand miles per hour. As this seems scarcely credible, I prefer to think that this angular displacement is the index of a progressing transmission of light through a lower stratum of atmosphere, or else a part of an auroral display. I am the more inclined to consider the phenomenon as the result of a progressive transmission of light from the body of the planet through changing media, since the size and consistency of the nucleus changed considerably during the hour. I decline, however, to speculate on the subject, and give the fact and measure for what it may be worth.

Within the last few years many of these bright spots have been observed. That they seem to have a rapid motion has been shown over and over again. Some of them have been followed entirely around the planet.

I will add, that for the last two years the color of the equatorial belts has remained gray or brown; for some time previously they had borne a ruddy hue. Occasionally the margins of the main belts have been tinged with red, and sometimes with a very fine blue. Within the last two years two very marked changes have occurred: 1. There are now three distinct broad equatorial belts in place of two. 2. A very conspicuous belt now stretches entirely across the Southern Hemisphere of the planet, and in apparent contact with the red spot. Its northern margin, on the finest nights, is almost blue. It has been forming for months past, but has taken its distinct outline within the last six months. It is now a prominent feature of the great disc immediately south of red spot. It would be highly instructive could all these successive changes be presented to the eye by such drawings as would show not only the correct shape and outline through successive weeks, but also discharges in consistency, continuity and color.

MORRISON OBSERVATORY, January 6, 1882.

NOTE.—On January 22d at 7h. 30m., an entirely new belt was observed in the Equatorial Zone of Jupiter, situated between the middle and southern equatorial belts. It was continuous and very fine and sharp. I have never before seen a belt in this position, though I have carefully examined the planet many

hundreds of times within the last few years. The space between the broad equatorial belts is usually more or less filled with irregular cloud masses. On this occasion it was entirely free from them. The middle and northern equatorial belts were very fine and even, and assumed their usual ruddy hue, while the southern equatorial belt was nearly three times broader than the other two and was quite dark. The atmosphere was the finest I ever had for distinct and steady images.

GLASGOW, MO., January 23, 1882.

ASTRONOMICAL NOTES FOR FEBRUARY, 1882.

BY W. W. ALEXANDER, KANSAS CITY, MO.

MERCURY.

Date.	Right Ascension.	Declination S.	M. T. of Meridian Transit.
1st.	22h. 08m.	12° 02′	1h. 21m. P. M.
5th.	22 27	9 19	1 23
10th.	22 40	6 35	1 17
15th.	22 38	5 22	0 53
20th.	22 23	6 04	0 21
25th.	22 00	8 05	11 35 A. M.
28th.	21 52	9 51	11 14

VENUS.

Date.	Right Ascension.	Declination S.	M. T. of Meridian Transit.
1st.	20h. 48m.	18° 57′	11h. 57m. A. M.
5th.	21 03	17 58	0 00
10th.	21 28	16 12	0 06 P. M.
15th.	21 53	14 14	0 11
20th.	22 18	12 05	0 15
25th.	22 41	9 49	0 19
28th.	22 55	8 24	0 21

MARS.

Date.	Right Ascension.	Declination N.	M. T. of Meridian Transit.
1st.	5h. 46m.	26° 53′	8h. 57m. P. M.
5th.	5 47	26 49	8 42
10th.	5 48	26 43	8 24
15th.	5 51	26 38	8 07
20th.	5 54	26 32	7 52
25th.	5 59	26 26	7 36
28th.	6 03	26 22	7 28

Semi-diameter on the 1st, 6.3″; on the 28th, 5″.

JUPITER.

Date.	Right Ascension.	Declination N.	M. T. of Meridian Transit.
1st.	2h. 59m.	16° 05′	6h. 11m. P. M.
10th.	3 02	16 21	5 39
20th.	3 07	16 42	5 04
28th.	3 11	17 01	4 37

Semi-diameter on the 1st, 19.4″; on the 28th, 17.8″.

SATURN.

Date.	Right Ascension.	Declination N.	M. T. of Meridian Passage.
1st.	2h. 19m.	11° 23′	5h. 30m. P. M.
10th.	2 20	11 35	4 56
20th.	2 23	11 51	4 20
28th.	2 25	12 05	3 51

Semi-diameter on the 1st, 8,4″; on the 28th, 8.0″.

APPARENT ELEMENTS OF THE RING.

Outer Major Axis 39.9″, Minor Axis 12.7″. Inclination of northern semi-minor axis to circle of declination from North to East, 10.7′. Elevation of the Earth above the plane of the ring, 18° 35′; elevation of the Sun 20° 24′. Earth's longitude from Saturn, counted on plane of ring from the ring's ascending node on equator, 88° 34′, ecliptic 45° 50′.

URANUS.

Date.	Right Ascension.	Declination N.	M. T. of Meridian Transit.
1st.	11h. 16m.	5° 33′	2h. 27m. A. M.
14th.	11 14	5 44	1 34
28th.	11 18	5 58	0 37

NEPTUNE.

Date.	Right Ascension.	Declination N.	M. T. of Meridian Transit.
1st.	2h. 48m.	14° 17′	5h. 49m. P. M.
14th.	2 48	14 20	5 08
28th.	2 48	14 25	4 14

PHENOMENA.

On the 2d—Mars, stationary in right ascension.

On the 2d—Neptune in quadrature, or 90° east of the Sun.

On the 3d at 10h. P. M., Mercury in ascending node.

On the 5th at 11h. P. M., Jupiter in quadrature.

On the 5th at 11h. 55m. P. M., conjunction of Uranus and the Moon. Uranus north 6° 10′.

On the 6th at 5h. P. M., Venus in aphelion.

On the 6th at 9h. P. M., Mercury, greatest elongation east 18° 13′.

On the 8th, Mercury in perihelion.

On the 13th at 6h. A. M., Mercury stationary in right ascension.

On the 17th at 11h. 22m. P. M., conjunction of Venus and the Moon. Venus south 6° 47′.

On the 18th at 9h. A. M., conjunction of Mercury and the Moon. Mercury south 1° 38′.

On the 18th at 9h P. M., Mercury at greatest heliocentric latitude, north.

On the 20th at 6h. P. M., conjunction of Venus and the Sun, superior.

On the 22d at 2h. P. M., conjunction of Saturn and the Moon. Saturn south 4° 38′.

On the 22d at 12h. P. M., conjunction of Neptune and the Moon. Neptune south 3° 34′.

On the 23d at 9h. A. M., conjunction of Jupiter and the Moon. Jupiter south 2° 07′.

On the 26th at 1h P. M., conjunction of Mars and the Moon. Mars north 5° 11′.

METEOROLOGY.

CONTINUOUS IMAGES OF LIGHTNING.

BY R. A. BLAIR.

The evening of June 18, 1875, in the locality of Sedalia, Mo., was remarkable for its unusual electrical display. The north was sullen and black. An almost continuous occurrence of sheet-lightning in the background illuminated the dense clouds in front, through which intense strokes of zigzag lightning made a terrific effect. Following one of these last forms, my attention was arrested by its leaving a counterpart or image of itself, which was brought into distinct and sharper relief by the flashes of sheet-lightning occurring as above stated.

The image disappeared from below upward, gradually; its entire duration being about forty or forty-five seconds. Fifteen minutes afterward a similar stroke left an image equally as sharp, with a duration of, say, fifteen seconds. Both images appeared of a sharp brown color.

Will some one explain the phenomenon?

NOTE.—Were it not for the duration of these images we should be inclined to attribute to their presence to the impression of the vivid flash upon the retina of the observer. The dark color of the images also confirms this idea, but such images usually last much less time, so that if Mr. B. is positive as to the time, we must look to some peculiar condition of the atmosphere for the explanation of the phenomenon.—[ED. REVIEW.

REPORT FROM OBSERVATIONS TAKEN AT CENTRAL STATION, WASHBURN COLLEGE, TOPEKA, KANSAS.

BY PROF. J. T. LOVEWELL, DIRECTOR.

Highest barometer during month 29.35, on the 16th. Lowest barometer during month 28.54, on the 27th.

Highest temperature during month 30°, on the 13th. Lowest temperature during month 5°, on the 17th.

Highest velocity of wind during month 46, on the 1st. Prevailing direction, south. Total travel, 10,782 miles.

The usual summary by decades is given below.

TEMPERATURE OF THE AIR.	Dec. 20th to Jan. 1st.	Jan. 1st to 10th.	Jan. 10th to 20th.	Mean.
MIN. AND MAX. AVERAGES.				
Min	23.5	18.7	11.4	17.9
Max	46.5	42.5	36.9	41.5
Min. and Max	35.1	30.6	24 0	29.9
Range	23.0	24.8	25.5	24.4
TRI-DAILY OBSERVATIONS.				
7 a. m.	31.0	28.4	22.2	27.2
2 p. m.	39.8	38.4	33.4	37.2
9 p. m.	33.0	32.3	25.5	26.9
Mean	33.4	32.9	26.6	31.0
RELATIVE HUMIDITY.				
7. a. m.	.84	.77	.80	.80
2 p. m.	.70	.73	.87	.77
9 p. m.	.80	.78	.82	.80
Mean	.78	.76	.83	.79
PRESSURE AS OBSERVED.				
7 a. m.	28.90	28.96	29 00	28.95
2 p. m.	28.91	28.93	28.96	28.93
9 p. m.	28.97	28.97	28 97	28.97
Mean	28.93	28.95	28.97	28.95
MILES PER HOUR OF WIND.				
7 a. m.	10.6	9.8	13.6	11.3
2 p. m.	20.0	14.3	18.8	17.7
9 p. m.	11.8	10.3	14.2	12.1
Total miles	3852	3212	3718	10782
CLOUDING BY TENTHS.				
7 a. m.	4.4	6.8	4.5	5.2
2 p. m.	5.8	7.8	4.8	6.1
9 p. m.	4.6	6.9	2.2	4.4
RAIN.				
Inches	—	.21	.32	.53

METEOROLOGICAL NOTES.

ISAAC P. NOYES.

The above title is given to this article for the reason that herein I propose to speak of a number of points on the subject instead of devoting the whole article to one department, or to writing at this time generally upon the subject of the weather.

THE DARK DAY.—A peculiar condition of the atmosphere occurred September 6th, 1881, in many parts of the eastern section of the United States, which has passed into history as the "dark day."

The writer was on the Atlantic sea-board in the southern part of Rhode Island. Here it was quite foggy and the signal-horn at the light-house, at Point Judith, was sounded at stated intervals to warn mariners as to the location of that prominent and dangerous point of land making into the sea. But there was nothing peculiar about this, even though the sun was obscured, for it is a common thing to have such a fog here. Later in the day there appeared a yellowish tint in the atmosphere. There was a fine gentle breeze from the southwest and no sign of any sudden atmospheric change, though the air was quite "close." The while it grew darker and darker. We thought it local; but the reports from other places that evening showed that it was quite universal throughout the northeast section of the United States. What could be the cause of such a phenomenon? My friends, knowing that I had paid some attention to meteorology appealed to me. My reply to them was, I cannot solve it further than from the cloudiness and "closeness" of the atmosphere we must be in the confines of low barometer, and from the direction of the wind "low" must be traveling to the north of us.

But almost everybody said they smelled smoke, while a few opposed this idea for the reason, they said, smoke is heavier than air and travels near the ground, while this seems as high as the atmosphere itself. Some thought that there must be a hurricane to the westward and that in time it would reach us. My friend was building a small summer-cottage; it was all ready to raise, but the carpenters refused to take the risk—"If that blizzard reaches here it will destroy all our work; we had better quit for the day." It was then three o'clock in the afternoon. The cattle came up to the house as on regular occasions for the night, and the fowls went to roost.

Many people were scared and thought the world had come to an end. The stores and workshops were regularly lighted as at night. Everything green had a beautiful bluish tint—a tint that we would liked to have "fixed" if possible. About ten o'clock at night when there was no fire about the house or any near us we went out to take another survey. All was quiet—the larger stars were faintly visible. My friend and I agreed that there was smoke in the air, and that even the fires of all the farm-houses around there could not produce such an

effect—and the fires were not only all out now but had been out for a number of hours. We agreed that there must be a "big fire" somewhere, but we little dreamed that that fire was in Michigan, and that our fellow citizens out there were at that very moment in such a strait.

When the weather-map for the 6th of September came it revealed "Low" very high in the northeast. Therefore, the cloudiness and "closeness" in this section. We were in the confines of "Low"—it was too far away from us to produce rain—we were on the outskirts and got the attending cloudiness. "Low" being on such a high line made it very warm. Now we could understand why, although we smelled smoke, it was not *near the ground.* It was produced by an immense fire and that fire was at a great distance, hence the reason why it so diffused itself in the air and why it was not more noticeable along the ground than through the atmosphere generally. By this it will be seen that all though this phenomenon affected the air, it had nothing to do with meteorology; it was quite distinct from it and was the result of other natural causes rather than coming under the workings of "Low." Sure "Low" made the general cloudiness but it did not produce the yellowish tint in the atmosphere nor bring on the premature darkness of the day.

Fogs.—Some months ago, in connection with the weather, I conceived the idea of studying fogs. This summer while on a trip from Washington to Rhode Island, via Long Island Sound, I fell in with Captain O. C. Griffin, captain of "the sound" steamer "Stonington." I mentioned the subject to him. I proposed to send him a package of postal cards addressed to me, and asked him to send me a daily report of the weather of the "Sound," and particularly as to the degree and nature of the fog at night. He cheerfully agreed to comply with my wishes in this respect and faithfully forwarded the cards with the report to me every day. After receiving these cards for about a month I spread the maps on the floor, in a line according to date and arranged the cards in a like manner beside them. I think that any lover of science would have been delighted to see how nicely the two fitted and agreed with each other and how perfectly the one proved the other.

Here is a daily map of the atmosphere, made in Washington. Captain Griffin of course could have had no influence over the map, nor could he have known what it would be from day to day; neither could the parties here who make the map know anything of the report of Captain Griffin. Yet, when the two came to be compared, they fitted into each other as nicely as the work from different mechanics made after the architect's complete drawings.

From these reports there seems to be two kinds of fog, *i. e.*, fogs from two different conditions. First, a general fog which is the result of low barometer and which follows or exists within the area of "Low." A fog of this class will continue through the day as well as at night, so long as the locality is within the area of low barometer. It will not, however, be so thick during the day as at night; and then much depends upon the force of the wind to remove it to other places, say in the form of clouds. Fogs of this nature, by sailors are called "sea fogs,"

yet the sea is not responsible for them only so far as it furnishes plenty of material; it does not furnish the active agent (heat) which creates them, and they may occur inland or on the sea-board or lake shore wherever there is sufficient moisture to develop them.

Fogs of the other type, which sailors call "land fogs" may exist even in the very centre of the area of high barometer, and separately or in conjunction with it. The peculiarity of it is that it may not, and generally does not, reveal itself in force until about sunrise. The land retains the heat far better than water, and the land, especially in the neighborhood of bodies of water, retains much moisture.

All night long the land has been giving off its heat, taking more or less moisture with it. If through the night there is a good breeze this cloud like moisture will be wafted away toward the nearest or most powerful centre of "Low" and there will be no local fog; if on the contrary it is a still night this moisture will hover over the place, the while growing thicker and thicker. About sunrise the land has lost its most heat. So long as there was heat to ascend it buoyed up the suspended moisture, in this case called "fog" and kept it well expanded. The land becoming quite cool, the specific gravity of this suspended moisture, in the absence of ascending heat, settles together and returns to the ground in masses, the while becoming more and more dense forming a thick, heavy fog, probably the most impenetrable of all fogs. The returning sun, however, soon dispels this fog—evaporating it or forcing it away by establishing a centre of concentrated heat or local "low"—generating a breeze which transports it elsewhere in the form of clouds. From our present light upon the science of meteorology such would seem to be the nature and cause of fogs.

WHERE OUR STORMS COME FROM.—One of the strangest phenomena presented to us is the indifference of the most intelligent portion of the world to the actual facts of the weather and the eagerness with which they will jump at the mere *ipse dixit* of some person who trusts more to his imagination than to the plain simple facts in the case. Some "great European scientist," or some "great weather-wise American" has something to say about the weather; no matter how absurd, it is passed around from city to city. The people, who don't know anything about it, read and wonder, but are unable to do otherwise than to accept it, same as the world centuries ago, with no knowledge of the geography of the globe, necessarily accepted the last new tale of every adventuresome navigator or explorer.

Within the past year a "great English scientist" advanced some ideas, not very new however, about electric currents being the cause of the changes in our weather. "Electricity" has to shoulder a great deal; when one cannot explain a phenomenon in nature he puts on a wise look and credits it to electricity. The greater the reputation of the man the more ready the world is to accord him great wisdom and to accept whatever he says without question.

In regard to any "great English scientist," England, and indeed the whole British Isles, are not one-hundredth part large enough to study meteorology on—might as well undertake to study the geology of the world on an ordinary house

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lot. Meteorology wants an extensive territory. In Europe and Asia they have the territory, but their countries being independent of each other and there being no united action between them, with the exception of Russia, they are all too small to study meteorology in. In Europe and Asia they can never make a success of this study until they establish their stations without regard to country lines and send their daily reports into some common centre, or they might make a compromise in this and send the reports in to some three or four centres.

In order to establish where storms come from, at least how they pass over the country, we want stations over an extended territory—the greater the extent of the territory and the greater the number of stations the better, at least we want a sufficient number of stations to make the work reliable.

There is a common idea that all our storms come from the tropics. About the middle of November a short article appeared in the New York *Sun* to this effect; it was extensively copied by the papers throughout the country and was given a free and wide advertisement.

Now, I have claimed in all these papers that there is no way of studying the weather but by the weather-map. The Weather-Map of the United States is the most complete thing in this line the world has ever seen, for the simple reason that territory favors us; were we divided into a number of small countries we should be no better in this respect than Europe, but here we have an extent of territory 3,000 miles from west to east. The writer in the New York *Sun* very modestly (?) admits, first, that he don't know much about the weather, but this much he does know "that most of our storms come from the tropics." It is evident that this man does not see the weather-map, for if he did he would not have made such a statement. The weather-map shows the storm-centres ("Low") appearing in the west and taking their course toward the east sometimes on one line of latitude and sometimes on another, and not unfrequently changing from the south to the north, and even the reverse, as they advance. For the past six months not more than two or three have apparently come from the south, and indeed only one may be said to have come direct from the tropics, that which centered over Charleston, S. C., on the 27th of August, and which on the 24th was reported to be at St. Thomas, with a direction toward our coast.

We are wanting in stations in this quarter of the globe, so we cannot explain the course of such "Lows," yet from the similar course of many over the United States, I am under the impression that when one of these "Lows" comes up from the south, taking so nearly a due north line, it is simply an erratic course of a "Low" that was travelling on some southern line, as we frequently see in the United States. It not unfrequently happens that a south "Low" with us, one that is picked up in Texas, instead of keeping on a straight or comparatively straight line, takes a line for 1,500 miles almost due north. This being the case where we have stations and can prove it, does it not seem that it may likewise be the case with these erratic "Lows" which once in a great while come up direct from the West Indies?

Storms not coming from the tropics, where do they come from? Nowhere. This may seem queer to the reader, and he may say, What! such a positive thing as a storm come from nowhere? Yes, so far as *locality* is concerned. The storm comes from "Low" or is caused by the centre of the area of low barometer. But where does this come from? may be asked. These pages have explained over and over again, that "Low" is the concentration of the Sun's rays, best represented by a magnifying glass (double convex lens) so held as to throw upon a sheet of paper a ring of light which being moved over the paper well illustrates the movement of "Low."

From what information we have it is quite evident that this area of "Low" continually travels around the world, on irregular lines toward the rising sun. These "Lows" appear in the west, sometimes on a high line, sometimes on a low line, and, as repeatedly said in these pages, travel on various lines toward the east. Wherever they are there will the storm be, and without them there can be no storm. *This is where the storm comes from.*

THE PECULIAR MISSION OF "HIGH."— A number of times I have said that in "some future paper I would more particularly refer to 'High,'" but somehow or other "High" has always been crowded out by "Low," and yet it performs a most important part in our meteorological economy; generally not so important as "Low," yet once in a while it plays a most important part and changes the whole aspect of a storm, modifying it or changing its course in such a manner as to create an entirely new condition of things—making it pleasant weather where the day before it indicated a storm, and sending a storm when the day before it would seem that pleasant weather would be the order of the day. "High" travels as regularly from the west toward the east as "Low." When "Low" is in the south it is cold, but if perchance "High" lies in an extended line east and west, the north wind will not be far from the north, therefore not very cold. When "Low" is in the north and "High" holds the same relative position in the south the wind will not be so very warm; in other words "High" acts like a barrier—like a high wall and shuts off the heat or cold as the case may be.

Then if "High" is immediately in front of "Low" as the two are moving toward the east, it will retard "Low" so its speed will not be so rapid. Again, as in the Chicago snow-storm of the 19th of March, 1881, two "Highs" may be near together and the space between them act like a huge cañon, which increases the speed of "Low" as it is drawn toward the narrow file that separates them, or its course be altered, as in the case of the "Low" that centered off Charleston, S. C., on the 27th of August, 1881. August 26th and 27th "High" was moving off the coast from Virginia to South Carolina. Notwithstanding this, it was expected that the "Low" from St. Thomas would follow the Gulf Stream along the coast—danger signals were ordered along the line. But from this point "Low" moved very slowly. "High" not only held it in check but was of sufficient power to deflect it to the northwest, and we saw, what is quite uncommon, a "Low" reversing its course—traveling toward the west! And this it contin

ued to do, the while struggling to regain the easterly course, till the 31st of August when it almost disappeared, yet on the first of September it regained its strength and direction and with great speed went on a high line toward the east, creating thunder-storms and making it very hot on the line of its course.

Such are the freaks of "High" and the manner in which it not only unfrequently becomes the *positive* in the place of the *negative* element in a storm.

The storm of the 27th of August at Charleston well illustrates the absurdity of attempting to foretell the weather weeks and months in advance, and how the world—all who will not heed the weather-map—may be deceived by some ignorant "weather-prophet."

Mr. Vennor has complained that the *press* of the country has not done him justice, though probably there never was a man for whom the *press* has done so much; and that too when to take his part was to expose their own ignorance.

When a man puts himself on record in public print he establishes something whereby he must stand or fall. If what he says be sensible and true it will be of credit to him, if on the contrary he states that which is absurd and erroneous, it is the most powerful means whereby he can bring discredit upon himself, perhaps not immediately, but most surely when the world is advanced sufficiently to judge the matter.

On the 25th of September, in the Boston Sunday *Herald*, Mr. Vennor in a long letter made the most absurd claims for the work of the year and wound up by claiming the storm which came up from St. Thomas and centered over Charleston, S. C., August 27th, because he had said that on the "25th and 26th of August there would be storms on the lakes and around New York." He was, he said, only a little off on dates and locality, but it was the storm (!).

People not familiar with the weather map cannot see or understand the full absurdity of this claim, any more than if they were unfamiliar with the geography of the country, and some one should tell them that Charleston, S. C., was on the St. Lawrence; yet geographically it would not be a greater mistake to place Montreal on the South Carolina coast, or Charleston on the St. Lawrence, than meteorologically for a man to claim that the storm that was over Charleston on the 27th of August was identical with the one that Mr. Vennor said would be, but was not, over the lakes and St. Lawrence on the 25th and 26th.

Not only Mr. Vennor, but all would-be meteorologists had better study well the weather-map ere they put themselves on record as weather-prophets. The weather-map is one of the grandest incentives to science the world ever knew, and it is the *only medium* whereby we may understand the weather. It is one of the strangest things in the world that the intelligent classes so neglect and completely ignore this, the only instrument and medium whereby they can study the geography of the atmosphere. The files of this map in years to come will put to shame all weather-prophets and their absurd systems. It would seem if they had any regard for the future that they would see this and would discontinue their absurd publications.

WASHINGTON, D. C., December, 1881.

SCIENTIFIC MISCELLANY.

A PLEA FOR NATURAL HISTORY MUSEUMS.

BY PROF. S. H. TROWBRIDGE.

In a previous article,* the absolute necessity of natural objects for the purposes of school and college instruction was set forth in the words of practical and experienced men who had every opportunity to know whereof they affirmed. In this, I shall attempt to show, by a somewhat similar array of authorities, their value to the community at large, and especially to thoughtful persons who have gone beyond the education of the schools.

To the increasing number of those who give especial attention to the study of science, the effort to impress the importance of natural history collections may seem superfluous. Not so, however, to those who teach it. And while there is a more or less vague idea in the minds of many that the study of nature has in it somewhat of interest and a little of profit, something more is needed to give its value greater prominence and make more real and tangible its interest. There are too much pleasure and profit in it to be lost for the mere lack of a little appreciation, when this can be so readily acquired. The fact that the State of Massachusetts and the friends of the Museum of Comparative Zoölogy have contributed over a million dollars to this means of popular instruction ; that a vast amount has been devoted to the Museum of Natural History in Central Park, New York, and also to the National Museum at Washington ; that museums of varying size and value are accessible to the public in all the best universities and colleges of the land ; and that zoölogical gardens, at great expense, are founded, maintained and well patronized, in most of our large cities, shows that there is some popular appreciation of such collections. Showmen, like Barnum and others, know, from the popular interest in animals, how profitable paid exhibitions of them in museums and menageries are. And even circus managers are shrewd enough to anticipate the public taste and provide for its gratification by attaching menageries to their performances, in order to attract those who crave something more profitable and instructive than mere amusements, as well as to give moral weight to a business sadly in need of it.

The safety of our land is in the education of its people. But interest and attention must first be excited before the mind can receive and comprehend valuable information. One's interest in any object is just in proportion to what he knows of it and does for it. Ancient Rome had her baths and gymnasia for the benefit of her people, and the national games of the Greeks were instituted for a

*This REVIEW, October 1881. "Science Teaching."

similar purpose. Heathen culture of past ages ought not to shame the intelligence of the present day. The committee appointed to establish a memorial to the late Prof Louis Agassiz decided that "The most fitting memorial must be the completion of his life's work. The completion of the museum in accordance with his plans and its liberal endowment, would be of infinite value to the educational interests of the whole country." Dr. Newberry, State Geologist of Ohio and Professor in Columbia College, New York, says in regard to natural history collections: "To the public at large they arrest attention and excite interest, the first step toward scientific education in the individual or community." The late Joseph Henry, of the Smithsonian Institution, also says: "They are well calculated to arrest attention and give definite impressions." Dr. Winchell, of Michigan University, says: "A donation of natural history specimens is a monument not only *aere perennius* but *aere utilius*. Would that our people might learn, like the Germans, to place less faith in brick and mortar, and more in books and the materials of science." Seeing a thing impresses the mind more forcibly than reading or hearing about it.

Ward's gigantic restored mammoth, as large as a house of moderate size, and his casts of monstrous animals of ages past, are grand educators because they call attention to natural objects and excite a desire to know their history. None can look upon them without astonishment and increased mental activity. Less striking specimens are, in their degree, equally potent in the same direction. A complete series of natural history specimens gives an ordinarily thoughtful spectator, or even a casual observer, many ideas in regard to the classification and relations or affinities of past and present organisms, their geographical distribution and grouping in different localities, and many other facts which can hardly be obtained in any other way. In short, it gives ample illustration of all that science has thus far deciphered of the plan of creation. The Agassiz memorial committee say: "The Museum he labored for is a presentation of the animal kingdom—fossil and living—arranged so as to picture the creative thought. The study of such a subject is the highest to which the human mind can aspire." A good museum should show, first, as full a representation as practicable of all the quadrupeds, birds, fishes, insects, plants, and fossils, which together constitute the complete fauna and flora of the vicinity in which it stands, and then, as soon as possible, of the whole territory represented by its friends and patrons. Its collections in botany should illustrate every obtainable peculiarity of vegetable structure, in wood, bark, root, leaf, flower and fruit. In the line of zoölogy there should be a full showing of the whole animal kingdom. In agricultural sections especial attention should be given to entomology, than which nothing can be of more interest to grain, fruit and vegetable cultivators, who lose millions of dollars annually by the ravages of insects. The cabinet should associate with the various noxious and beneficial insects, in their several stages, the food on which they live, their parasites and victims, so as to *present to the eye* an instructive history of each, such as every farmer's son, to say the least, should be familiar with. The mineral and fossil collections should show the characteristics of every

group of rocks in that section of the country, so one could hardly fail to *see the plan* in the order of creation, could see where coal may or may not be found, and also determine the probable presence or absence of iron, lead, zinc, baryta, ochres, clays, etc. A complete museum would also show the plants, animals, fruits, and other products from every quarter of the globe, so one in reading about different countries, or who has a special interest in some one, can see what organisms belong there and can get a good idea of the country without going to see it.

The wanton destruction or waste of valuable scientific material is a matter for very serious consideration. This unintentional, though not less impoverishing vandalism, is lamentably frequent and prevailing. Skeletons, pottery, stone and flint implements, and other remains of our pre-historic inhabitants are frequently plowed up in the fields. They attract a moment's notice, perhaps are picked up, then laid away and forgotten, or more frequently are crushed and scattered by the plow till they are rendered utterly worthless. Mastodon and other remains often share the same fate. It is exceedingly trying to the sensibilities of a lover of nature to see the almost criminal carelessness of the unappreciating possessors of these instructive objects, Sometimes they are held, from some indefinable fancy, with a tenacity which might argue a love of nature, and yet the way the precious things are abused and ruined dispels at once this charitable delusion, and is often enough to stir up the righteous indignation of a saint. May not the lover of science under these circumstances obey the command of Scripture, "be ye angry and sin not." Among several somewhat similar experiences, the writer distinctly remembers one in which a student solicited a valuable specimen for him as curator of a growing museum, and was indignantly refused with the statement that the owner thought more of the specimen than of the curator. Yet its beautiful angles and faces were destroyed and the whole ruined by the knocks and kicks it received by being tumbled about in a dingy out-building. In nearly every home, or about it, objects of scientific value are to be found lying about where they are liable to be injured and lost. They are doing nobody any good, yet they could readily command valuable returns to those possessing them, and at the same time would contribute very greatly to the interest of people in science and, hence, to its rapid advancement. These are held as curiosities or given to children for their amusement; and whether held by young or old, if they elicit no thought or study, and create no knowledge or inquiry concerning their history, they are merely *children's toys*, affording no profit—simply idle amusement. A child can be amused with either a watch or a jumping-jack to play with; but the latter is more economical and equally effectual. These valuable historic objects, as mere curiosities, in the hands of old or young, are virtually watches for children's playthings instead of jumping-jacks. It may be of interest to such delighted owners to know that all scientific material has a certain money value—"a value which," says a dealer in this material, "can be as surely and as speedily realized as that of any description of property." Holders of such specimens can also exchange them, with any well-stocked museum, to mutual advantage, for

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others not so easily obtained in their vicinity and thus, in time, form a collection, while not less amusing and attractive, much more varied and instructive. Material thus received can easily be accompanied with instructive facts concerning its position, relations, habits, etc., which will be doubly valuable because they stimulate thought as well as furnish pastime and amusement.

National and State governments make laws to protect fish, birds, etc., at certain seasons of the year for a greater public benefit at other seasons. They should also provide some way of preventing the destruction and misapplication of archæological and other scientific material, so it may be legitimately employed for the advancement of science and for the increase of popular intelligence. The Danish government requires that scientific collections made on its territory shall be deposited in the national museums. A scientific commission in England is intended to accomplish a similar end there; and such a commission or department in our government is a consummation devoutly to be wished, and one which the growing intelligence of our people will doubtless, at no far distant day, demand and then supply. May friends of science and of national progress speed the day.

Museums are also of great advantage for encouraging and fostering original investigation. As the question of evolution or of creation is racking the whole scientific and religious world, and is so largely to be settled by having an unbroken series of all life in chronological order for examination, the vast importance of extensive collections of fossils can hardly be over-estimated. A writer in the *Advance*, some time ago, said: "The science of geology, dealing as it does with the only visible record of any considerable age, in regard to the history of life upon our planet, must settle the vexed questions—if they are ever to be settled—of the origin of species, the antiquity and perhaps the unity of man. To many, the acceptance of the new theories on these points is equivalent to legislating God out of the universe. If so many are wrecked upon these questions, the correct understanding of them is a matter of no little importance." Mr. Agassiz has said, "The question of the geographical distribution of animals lies at the very bottom of the question as to their origin." This must be shown by complete faunal collections from all localities, which can be seen only in large museums. Museums are valuable, too, for studying the life history of various animals, when a large series of allied forms, showing the variations of life, habit and characters, are accessible for comparative study. Here the investigator often learns that forms which were supposed, from their lack of resemblance, to represent different species, are connected by a regular gradation of similar forms and are really the same. A large series is often necessary to enable the investigator, who is studying new or rare forms of which perfect specimens are seldom seen, to determine the species, relation of parts, size, shape, etc., of the complete animal. One fragment will supplement another, throwing new light in various ways, and thus furnish material for the restoration of the complete animal.

Questions of practical importance are continually arising in regard to one or another of nature's products which, for lack of sufficient data at home, have to be

sent, at considerable expense of time and money, to distant museums for investigation. Because of this necessity many facts of vast financial importance are never gained. Men will not take the trouble to send to a distance for knowledge whose value is not adequately comprehended on account of its very distance. Dr. Dana, of St. Paul, says: "It is utterly chimerical to think that Western men can look to Eastern institutions for higher education. The latter is the vital function of every commonwealth, and can no more be transferred than its political responsibilities. For the West to rely upon the East for liberal education, would put her, according to Dr. Post, 'in the attitude of France in relation to Paris; of vast and inert provinces feebly feeling the pulse of the distant and intellectual capital.'" So far as possible, each State should have so complete a museum that no student of nature would be compelled, for anything but the most exhaustive study of unique specimens, to seek facilities for study in a distant college or museum, but could find at home collections which would attract students of science, practical scientists, and unscientific men needing scientific information, from every quarter. A collection of specimens from Kansas was recently taken to Agassiz's museum, in Cambridge, Mass., to be identified and classified, for want of facilities at home. To the same place also were shipped, for a similar purpose, materials by the ton from the Kentucky Geological Survey. Material of like character and amount is stored within the limits of Missouri, with little knowledge of its value, from lack of facilities for determining it here. Other material from this State is now in the Archæological Department of the Smithsonian Institution, by request of authorities there, because of the peculiar richness and value of the objects which this State affords. And this is by no means the first time that scientific material from Missouri has been solicited for study in Washington, Boston, and other favored cities of the East. Yet, unfortunately, vast supplies of all such material throughout the State are allowed to "lie here ungathered and waste upon the plains." Much of this material is new to science, and is rich in suggestive questions that have never been answered, but which might and should be solved by her own citizens and upon her own soil.

Again, museums are of vast importance in giving us increased knowledge of God and his works, as does the Bible. Nature, not less than scripture, is a revelation from God. Each was designed to supplement and complement the other. Neither can be understood in all its fullness without illumination from the other.* Mr. Agassiz has said: "Collections of natural history present the plan and mind of God in creation." "If I mistake not, the great object of our museums should be to exhibit the whole animal kingdom as a manifestation of the Supreme Intellect. The time is past when men expressed their deepest convictions by wonderful and beautiful religious edifices; but it *is my hope to see*, with the progress of intellectual culture, a structure arise among us which may be a temple of the revelations written in the material universe. If this be so, our buildings for such an object can never be too comprehen-

* For illustrations of their mutual helpfulness, see "The Bible and Science," this REVIEW, October, 1880.

sive, for they are to embrace the infinite work of Infinite Wisdom. They can never be too costly, so far as cost secures permanence and solidity, for they are to contain the most instructive documents of Omnipotence." The late Prof. Orton says: "A cabinet unfolds the great idea of God as it marched on to realization. To the theologian, philosopher and student, it is a vast repository of thoughts and suggestions to which the Astor Library is nothing." In a notice of the Ward Cabinets, we read: "No one can enter this truly cosmological museum without believing that he has before him, in one volume, God's narrative of creation. For he who classifies the results of those six days of labor by the erection of a complete repository of natural objects in natural order, is a translator of the Creator's thoughts." A well selected and arranged museum presents to the eye, in physical form and in minuter detail, the panoramic view of creation which Moses expressed in words. In one of his talks to his students, at Penikese, Mr. Agassiz said: "The study of nature is direct intercourse with the Highest Mind. It is unworthy an intelligent being to trifle with the works of the Creator. A laboratory of natural history is a sanctuary, in which nothing improper should be exhibited. I would tolerate improprieties in a church sooner than in a scientific laboratory."

Since nature is another revelation from God, why should not facilities for studying her in good museums be as worthy an object of Christian liberality and the use of consecrated funds as the erection of churches and the distribution of Bibles? Christ commonly impressed his truths by illustrations from some phenomena of nature. And religious teachers would do well to pattern after their exalted Model and know nature better for increased power in their work. The time is doubtless not far distant when theological seminaries, as well as colleges and universities, will be required, by the demands of the times, to have collections specially adapted to teach the order of creation and to illustrate the vast number of scientific allusions in the Bible; and also to have competent professors who are especially qualified to bring out in full relief the scientific phases of Bible truths and the Scripture phases of scientific truths.

In a Missouri publication, it is not inappropriate that this article should have somewhat of local application. The State of Missouri, the geographical centre of the Union, than which no State has been endowed by nature with vaster and more varied stores of animal, vegetable, and mineral wealth; with fertile fields of science ripe for the harvest in all the adjoining States; with ready access to the Rocky Mountain regions containing the richest stores of scientific material in the known world, to the Mexican Gulf rich in recent animal life, and to Texas equally rich in remains of ancient life; and midway between the two great oceans that wash our shores, is peculiarly favorable for the seat of a large museum. There is no apparent good reason why in Missouri may not be accumulated collections, in all lines of popular, practical, and scientific interest, which shall afford every desirable facility for improvement, instruction, and original research; be a credit to friends and a source of profit to our citizens, an honor to the State, and a valuable contribution to the advancement of science everywhere.

XUM

That the formation of such collections, both living, in zoölogical and botanical gardens, and dry, in cabinets and cases, is practicable is capable of easy demonstration. As has already been intimated, this State abounds in specimens which are prized and solicited by curators of museums, collectors, and students in all parts of the United States. Many private collections of great value have been accumulated here, almost entirely by the efforts of the individual owners, with but little expense and less outside assistance. The richest of these have been in the line of Indian relics, in which this State is remarkably rich, yet its wealth has been but very imperfectly explored; also of fossils, minerals and plants. Unfortunately for the credit and welfare of our State, some of the most valuable collections found here have gone to enrich eastern museums on both sides of the Atlantic. They should have been kept here and could have been, had they been properly appreciated. With a full supply of home material, and sufficient assistance in preparing it for scientific use, duplicates can easily be exchanged for valuable material in abundance from other collections from distant localities representing forms which are not to be found here. Unfilled applications for specimens from this locality, with tempting offers in exchange, are constantly in possession of both professional and amateur collectors here. Systematic collections and cabinets, labeled and arranged with care, are always to be purchased for a reasonable sum. These range in price from that of Ward's magnificent collection of casts, representing most of the extinct animals and plants that have inhabited the earth, costing thousands of dollars, to choice cabinets of birds at a cost of fifty to three hundred dollars, even to fine suites of shells, minerals, plants, etc., for a dollar or more. Expeditions can also be fitted out at moderate expense which will rapidly increase the material needed.

Friends of such a museum and of science can readily be induced to present collections of large or small amount, obtained by purchase or otherwise. This will vastly augment the pleasure and profit they derive from the museum, and their pride and interest in it, as well as *its* facilities for contributing to the pleasure and profit of the community at large. It is interesting to see how contagious is the spirit and practice of contributing to a good cause. One can easily provoke others to good works. And the possession of a considerable nucleus is almost sure to attract donations in greater number, illustrating the doctrine of Scripture—and of human nature as well—that "to him that hath shall be given," and demonstrating the truth of the trite maxim that "nothing succeeds like success."

BOOK NOTICES.

NEWFOUNDLAND TO MANITOBA. By W. Fraser Rae. 12mo. pp. 294; with maps and illustrations. G. P. Putnam's Sons, N. Y. For sale by M. H. Dickinson, $1.25.

This is an account of a trip from Newfoundland, via Halifax, across the Dominion of Canada, into the Province of Manitoba, in the autumn and winter of 1880, by the writer, who was at that time a correspondent of the London *Times*.

It is made up of statistical and general information concerning the resources and advantages of Newfoundland, Nova Scotia, New Brunswick, Prince Edward Island, the Red River country, Manitoba, New Iceland, the northwest Territories and the Canadian Far West. And to the ordinarily informed reader the facts detailed will be astonishing. Few people realize that even in Newfoundland, which lies between 45° and 55° north latitude, fair crops of barley, oats, turnips and potatoes are grown, while grass and consequently, cattle and sheep, flourish luxuriantly. Nova Scotia, is better known from Longfellow's Acadian scenes in "Evangeline," than from almost anything else, as an agricultural region, but is not generally credited with being the productive mining country that its statistics prove it to be. Coal and iron are largely produced, while the amount of gold mined in the auriferous area of 3000 square miles, is quite considerable.

As we proceed westwardly with our traveler we are in turn impressed with the extent of the lumbering and cattle trade of New Brunswick, the immense mackerel and lobster preserving industry of Prince Edward Island, also her potato crop, amounting some years to 3,500,000 bushels, the comprehensive system of railways of the Dominion, the exceedingly valuable copper and silver mining regions along Lake Superior, the unequaled mammoth farming in the valley of the Red River of the North, within the borders of the United States, and its lovely scenery outside of the boundary line most of the way to Winnipeg, the capital of Manitoba.

Winnipeg is described as a well-built city of 15,000 people, with churches, stores, custom house, an university and academies and an Historical and Scientific Association.

Manitoba itself is a vast dominion, larger than any State of our Union, except Texas and California, and possessing most of the advantages and excellences of Minnesota. One scourge noticed by Mr. Rae is the locusts or grasshoppers, which have appeared there thirteen times since 1812. In short, Manitoba is the "Prairie State" of Canada in all respects.

Mr. Rae is an interesting writer and his book will be of great service in developing the regions described and of which, comparatively, so little is known.

XUM

A MANUAL FOR COMMISSIONERS OF THE CIRCUIT COURTS OF THE UNITED STATES. Prepared by Warren Watson. Callaghan & Co., Chicago, 1882.

Mr. Watson has been Clerk of the Western District of Missouri for a number of years and has acquired a familiarity with the forms of practice not readily attained otherwise. Not only are all the duties and powers, qualifications of commissioners, systematically and clearly set forth, but all the forms used in proceedings before them and the opinions of several of our best Federal judges touching doubtful points in connection with the office, in full in this Manual.

A second edition having been so soon called for is an evidence of its value to the profession.

TRANSCENDENTAL PHYSICS. By Johann Carl Friedrich Zöllner. Boston; Colby & Rich, 1881.

This is an account of experimental investigations in spiritualism by the author, translated from the German by Charles Carleton Massey, a barrister at-law, of London, who also furnishes a comprehensive preface to the work.

In this preface he regrets the indisposition on the part of the public to see in the alleged phenomena of spiritualism a simple question of evidence, and claims that it is only from this point of view that it should be regarded, since the only elements of fallacy possible to be added by testimony, to original observation, are such as may result from defects of veracity, defects of memory, defects of judgment and defects of language, or the understanding of it by the recipient of the testimony. He also asserts that, to himself at least, so-called spiritualism represents no religious craze or sectarian belief, but an aggregation, (not yet to be called a system) of proven facts of incalculable importance to science and speculation Those who so regard the subject would adhere to their convictions of its truth and importance even though it were shown that every medium was a fraud and many spiritualists their willing dupes. Much of the evidence upon which they rely was taken on that very assumption, and the precautions taken had these suspicions in view.

The readers' attention is called to the work of Prof. Zöllner by the translator as a volume of facts and evidences, and all that is asked by him is "a fair judgment on the facts themselves."

Turning to the author himself, we find a discussion of Gauss' and Kants' theories of the four dimensions of space and a suggestion that the explanation of such acts in spiritualism as table-tipping and moving, tying of knots on endless cords, etc., may be found in the theory that "spiritual beings may exist in space, and the latter still remain penetrable for material beings, because their presence would imply an acting power in space, but not a filling of it, *i. e.*, a resistance causing solidity." These spiritual beings he calls "four-dimensional," and claims that "an intelligent being having the power voluntarily to produce on an endless cord four-dimensional bendings and movements, must be able without

loosening the seal to tie one or more knots in this endless cord," and so of all the other phenomena of spiritualism.

The book is filled with results of all manner of experiments in magnetism, chemistry and physics, which, whether attributable to spiritual influences or not, are quite inexplicable. After all, however, is it strictly logical to draw this particular inference from an inexplicable set or series of facts? Is the evidence so complete and full as to fasten upon the spirits, indisputably, the origination of these mysterious circumstances and occurrences? Taking it as a matter of proof alone, as our author and his translator desire, we fail to be convinced of the accuracy of their conclusions. At the same time it is not a subject to be lightly brushed aside. The facts given in this book, and known to all of us, lead somewhere, and it is the duty of educated and skilled scientists to follow them to their legitimate and sure conclusions, whatever they may be.

OTHER PUBLICATIONS RECEIVED.

Catalogue of the fossils of the Cincinnati Group, by Jos. F. James, Custodian Cincinnati Society of Natural History; *Ward's Natural Science Bulletin*, Rochester, N. Y., quarto, monthly, 50 cents per annum; Some New Compounds of Platinum, by F. W. Clarke and Mary E. Owens, University of Cincinnati; An Abstract of the Results Obtained in a Recalculation of the Atomic Weights, by Prof. F. W. Clarke; An Account of the Recent Progress in Anthropology for the years 1879 and 1880, by Otis T. Mason; The Palæolithic Implements of the Valley of the Delaware, reprinted from the Proceedings of the Boston Society of Natural History; Boulder County as It is, by John K. Hallowell, published by Colorado Museum of Applied Geology and Mineralogy, 15 cents; Minnesota Medical Mirror, Monthly, N. M. Cook, M. D., $1.00 per annum; Proceedings of the Boston Society of Natural History, Vol. 20, part 4 and Vol. 21 part 1.

EDITORIAL NOTES.

THE test made at Philadelphia, on the 5th ultimo, of the telegraph and telephone lines of the Underground Electric Company was declared eminently satisfactory. The stations were one mile apart and the slightest whisper could be heard from one to the other, and the solenoid or *metallic circuit* was pronounced far superior to the ground circuit.

PRESIDENT ARTHUR'S remarks upon polygamy have aroused, all over the country, a renewed and concerted opposition to it. It is, however, unnecessary for the people of this county to take any such action, since they "put themselves right on the record," more than forty years ago, by rising *en masse* and driving the Mormons from her borders.

THE Kansas City Academy of Science, through the courtesy of the Board of Education, will hereafter hold its meetings and keep its library and collections at the Public School Library room at No. 548 Main St.

THE meeting held here in behalf of the Garfield Memorial Hospital, to be erected at Washington City as a "cenotaph to the illustrious dead and a haven of health to the living," was well attended, and a committee appointed to solicit subscriptions. It was decided not to ask more than one dollar from any one, so that all classes might have the privilege of assisting in this tribute to the memory of the departed President. Col. Theo. S. Case was selected as Treasurer, to whom the contributions of those not called upon by members of the committee may be sent.

A BILL has recently been introduced in Congress granting the right of way, two hundred feet wide and three hundred yards on either side, for a canal across Florida and part of Georgia, connecting the Atlantic and the Gulf of Mexico, for the passage of steamboats, barges and light-draft ocean vessels.

CAPT. BERTHOUD, pays his annual compliments thus: "I enclose $2.50 for another year's subscription to the KANSAS CITY REVIEW; long may it flourish! I get so much in it that does not appear elsewhere that I do not care much for any other journal of science."

THE Kansas City Smelting and Refining Company are out with an extremely neat circular containing an analysis of their refined lead and a picture of their works at Argentine, Kansas. Accompanying their circular is a foil of their refined corroding lead, pounded from a plate one-half an inch in thickness by 3,400 blows of a sledge-hammer.

PROF. G. C. BROADHEAD sends us the following note from Pleasant Hill, Mo.: "On Friday night, January 13, 1882, at 9:10 Jefferson City time, going northward on the street, a bright light as of a torch caused me to turn, and across my shoulder to the southwest I saw a bright meteor—brightest I ever saw at night—passing about 10° west of Orion, bursting and vanishing in three seconds, but showing very bright streaks, calling to mind the electric light—violet, red and yellow; it threw off sparks and streaks each way and disappeared; night clear, but little wind and cool.

THE rich Greek banker, Syngros, has contributed another 100,000 francs for the foundation of a national archæological museum at Olympia, where the relics of antiquity recently discovered are to be exhibited.

OUR old friend, Dr. J. M. DeBall, write as follows: "Permit me to congratulate you on the success of your magazine. I hope the *cash* side of the account is fully up to the literary position of the REVIEW."

SAN JOSE, California, is lighted by means of a tower two hundred feet high and mounting six Brush lights. The tower is built of gas pipe, one corner resting on each of the four corners of the intersecting streets.

DR. JOHN W. DRAPER, author of "Human Physiology," the "History of the American Civil War," "The Conflict Between Religion and Science," etc., died, January 4th, aged 71, at his home, at Hastings on the Hudson.

THE glucose works at Leavenworth, Kan., are now consuming 2000 bushels of corn daily, and four tons of coal; working seventy-five men, and shipping three car-loads of syrup per day, and feeding two hundred head of cattle with the refuse.

ON a sun-dial at Visp, Switzerland, is the following Latin inscription, "Omnes time propter unam," which some scientific wag translated somewhat freely, "All *time* goes by this." In the same vein we suggest the knowledge of nitro-glycerine by the Romans, from the following line from Horace, "Uritme *Glycera nitor*."

XUM

A DETAIL has been made of a number of under officers of the navy to duty at the Smithsonian Institute with a view of adding to their course of training some matters pertaining to natural science which the Annapolis Academy does not give. They will then be expected when on duty to gather and furnish to the government whatever scientific information may come under their observation, so far as they are able, without neglecting their other duties. The German, Scandinavian, French and English navies have already such training, and have added to the scientific information of the world by their work. Our own navy, when aided by civilian scientists, has also done good work in this line.

THE Missouri Press Association meets this year on May 9th, at St. Joseph. An entertaining programme has been arranged, and the citizens and Board of Trade assure the members a cordial reception.

THE Eleventh Annual Live Stock Report of the Kansas City Stock Yards, for the year ending December 31, 1881, by E. E. Richardson, the very efficient Assistant Secretary, is not only a statement of the receipts and shipments for that year, but also a full and comprehensive comparative statement of monthly receipts and shipments of cattle, horses, sheep and hogs, by months, for the past eleven years; also the receipts and shipments over the various railroads centering here for the same length of time. From the report we cull the following items: Receipts for 1881: Cattle, 285,853; Hogs, 1,014,304; Sheep, 79,924; Horses, 12,592. Shipments for 1881: Cattle, 286,134; Hogs, 1,015,447; Sheep, 79,848; Horses, 12,604. Amongst the shipments are included those consumed in this city, viz: Cattle, 62,145; Hogs, 819,923; Sheep, 18,770; Horses, 2,548. The increase over 1880 is very large; the shipment and consumption of hogs, for instance, being 338,599, and other stock in about the same proportion. The total receipts since the opening of the yards have been: Cattle, 2,282,620; Hogs, 3,694,570; Sheep, 376,995; Horses, 76,898; a grand total of 6,431,082, of which a very large proportion, (that of the hogs being almost one-third) were received in the last year.

ITEMS FROM PERIODICALS.

THE Boston *Journal of Commerce* is a very able illustrated weekly paper, and as handsome as it is independent in tone. It has technical articles on workshop matters, tools, steam engineering and machinery. Its manufacturing intelligence of what is going on in the great centers is very full, and compiled especia ly for it.

THE Lawrence *Journal* says of the REVIEW, among other pleasant things, "The editor keeps his readers fully informed of the newest literature and the latest facts in the scientific and industrial world. The REVIEW is admirably sustained in all its departments."

THE Kansas City REVIEW OF SCIENCE AND INDUSTRY for January presents a table spread with the choicest fruits of scientific and industrial knowledge. * * * All of the departments are full of attractions to the scientific mind, and the editorial notes possess their usual excellence.—*Kansas City Journal.*

THE Leavenworth *Times* says that five sorghum mills are now running with good success in Kansas. The Ellsworth Sugar Company owns one hundred and sixty acres of land adjoining the city, and has a mill capable to turning out five thousand barrels of syrup per day. The capacity of the two mills at Sterling is nearly five hundred tons of cane per day. The mill at Larned has been in successful operation for the past two years, and has paid well. That near Great Bend, for the past season, after supplying the farmers of the neighborhood with syrup, had a surplus of forty thousand gallons, worth from forty to forty-five cents per gallon.

NUMBER 28 of the *Humboldt Library* consists of "Fashion in Deformity," by William Henry Flower, F. R. S. Octavo, 16 pp., illustrated, 15 cents.